CANADA'S AGRICULTURAL RESOURCES

Reprinted from the May 1946 Issue
of the
AGRICULTURAL INSTITUTE REVIEW
Published bi-monthly by the
AGRICULTURAL INSTITUTE OF CANADA
OTTAWA, CANADA

Distributed by
DOMINION DEPARTMENT OF AGRICULTURE
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Vol. 1, No. 5 OTTAWA, ONT. MAY, 1946

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Fertilizing before transplanting tobacco plants.
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CANADA'S AGRICULTURAL RESOURCES

Address all communications to the Managing Editor, *Agricultural Institute Review*, 1005 Confederation Bldg., Ottawa, Canada. Subscription rate is $2.00 in Canada and other parts of the British Empire, the United States, Mexico, France, Spain, Central and South America; in other countries, $2.50.

Authorized as second class mail, Post Office Department, Ottawa

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Editorial

Canada's Agricultural Resources

Canadian farmers during the war years stepped up production by about fifty per cent. Operating an industry valued at five billion dollars and turning out one and a half billion dollars worth of farm products annually, they have come a long way during the past sixty years. Since 1881, Canada's farm population has just about doubled, but the land area these farm people cultivate has quadrupled and the food they grow has increased many times over: wheat sixteen times; hogs nearly seven times; cattle and milk nearly four times. They produced enough to feed Canadians and have left about thirty per cent of total production for export.

This progress was made possible by the farmer applying his experience and the findings of the scientists to the cultivation of farm lands, to the growing of crops, and to the raising of live stock.

However, if agriculture is to maintain its position in the Canadian economy and if Canadian farm goods are to be able to compete on world markets, farmers must be able to introduce scientific farming on an ever increasing scale. It is recognized by all that farming can no longer be done by rule-of-thumb. Scientific agriculture today makes farming a profession.

The agricultural resources of a nation no matter how wealthy cannot be used in a carefree manner over any length of time. Canada's contribution to the world's food supply hinges on a better use of the land. Drainage and irrigation have enabled much land to be cultivated. In the Prairie Provinces, the agricultural policies of the Dominion Government and the Provinces have given aid in the conservation of soil resources. The soil and water surveys, and plant and animal research, are guides in planning agriculture.

This issue is a review of Canada's agricultural resources—the land, the crops, the live stock, the climate, the people—farmers and scientists. The articles deal with the changes in agricultural production and marketing, the future place of agriculture in the Canadian economy and the many problems that have to be solved by the united effort of the Canadian farmer, the extension worker, and the scientist.

L. B. THOMSON,
President, Agricultural Institute of Canada;
Superintendent, Dominion Experimental Station,
Swift Current, Sask.

A busy season for all hands.

The Place of Agriculture in the Canadian Economy

A prosperous agriculture is essential for a sound national economy and is, therefore, a matter of universal concern.

by W. M. DRUMMOND

Head, Dept. of Agricultural Economics, Ontario Agricultural College, Guelph.

WHEREVER and whenever the general economic life of Canada has been under review the almost universal practice has been to refer to the fundamental role played by agriculture in the nation's economy. While the actual statements regarding agriculture's importance have varied considerably, they have all served to stress the same central idea. For example, it has often been said that no general and lasting prosperity is possible in the absence of a prosperous agriculture. On other occasions the general economic structure has been spoken of as being erected upon an agricultural foundation. Many have referred to Canada as an agricultural country. Perhaps the most regularly repeated comment is the one which has referred to agriculture as our basic industry.

W. M. DRUMMOND

The very fact that these statements have been made so often and by representatives of every economic group or interest is, in itself, pretty good evidence of their validity. It is also true that, so far as the general public is concerned, there has never been any inclination to refute or even qualify the statements. On the contrary, the public has long since come to anticipate and accept them without question. In view of this fact and in order that the actual part played by agriculture may be more fully appreciated, it seems desirable to indicate, at least in outline, something of the extent to which and ways in which agriculture contributes to or is integrated with the economic life of the country.

Perhaps the first point to be noted is the fact that Canada's agriculture is an industry of truly large scale proportions. This is significant for the reason that, other things being equal, the importance of any industry varies directly with the scale of its operations. Some conception of the scale and scope of our present-day agriculture may be obtained by noting a few summary figures. When the 1941 Dominion Census was taken there were in Canada 734,760 occupied farms with a combined area of 174,974,391 acres. Over half of this acreage was in an improved condition and no less than 55,895,937 acres of improved land were devoted to field crops. Living on the farms were 3,163,288 or 27.5% of the country's population despite the fact that large numbers had just previously left to enter the armed forces or work in war industries. The most recently published official figures[1] show that in 1944 the combined value of land and buildings, the implements and machinery and the live stock on the farms amounted to 5½ billion dollars.

The foregoing statistics, together with those showing the actual volume and value of the various products,[2] lead to some obvious conclusions. One is that, as constituted at present, Canada's agriculture represents a very large amount of economic activity. Whether measured in terms of actual production or by the size of the farm production plant it is a large scale industry. In the second place it is clear that the industry is now characterized by a considerable degree of diversification and permanence. The types of farming and the nature of the specialization[3] reflect industrial maturity and an adaptation to the special physical and economic fitness of each region.

[1] Quarterly Bulletin of Agricultural Statistics, April-June, 1945.

[2] See article by Frank Shefrin in this issue.

[3] See following articles in this issue.

Some Major Contributions of Agriculture to Canada's Economic Life

Having noted the general character and extent of agricultural production, it is in order to examine the types and degrees of interrelationships which exist between the fact of this production and the economic life of the nation as a whole. It is obvious that the economic implications resulting from an agricultural activity of the magnitude indicated above cannot but be numerous and widely spread. The very fact that Canadian farmers use modern production methods involving capital expenditure in a great variety of specialized forms and that their products, for the most part, must enter commercial channels is sufficient to guarantee that the economic influence exerted by agriculture upon other sections of the economy is tremendous. The mere implementation and execution of our agricultural production implies an immense amount of economic activity on the part of non-agricultural groups. The same statement applies if one considers the performance of those many functions which are commonly grouped under the general title of agricultural marketing. Indeed the marketing of farm products includes many processing activities which when combined make up a large part of the secondary industrial life of the country.[1] A further important fast is that the money income secured from the sale of farm products provides a very considerable part of the nation's purchasing power. Moreover, a large part of the real income of the Canadian people is provided by the major portion of the agricultural production which is consumed within the country whether in raw or processed form. Further consideration of these and other facts may help to indicate their true significance.

One of the best ways of measuring the importance of any industry is to find out how many people depend directly upon it for a job and a livelihood. Applying this test we find that agriculture ranks an easy first among the occupations of Canadians. When the last census was taken there were no less than 1,246,622 people gainfully employed in farming. While this was considerably more than a quarter of the country's gainfully employed population, it should be noted that it did not include an almost equally large number of women and girls who were listed as house workers. In addition to providing jobs for a large fraction of the working population, it must not be forgotten that the entire farm population of considerably over three million depend directly upon agriculture for a living.

If agriculture is the source of employment and a livelihood for large numbers, it is also the main source of food supplies for everybody in the country. It is true that some of the food commodities cannot be produced in Canada and are therefore imported. It is also true that limited amounts of the kinds of food produced in Canada are imported under certain circumstances. In all such cases, however, the amount brought in constitutes a very minor part of the total consumed. For the most part it is true to say that the food consumed in Canada originates on Canadian farms. This is clearly evident from a comparison of imports with total consumption. It is, of course, what one would expect in a country where the majority of the food commodities are not only produced but exported in large amounts.

While the above-mentioned dependence upon agriculture for food is probably something which is so taken for granted that its real significance is apt to be overlooked, there is something else which is undoubtedly less obvious and hence less generally appreciated. We refer to agriculture's contribution of the raw materials used in our manufacturing plants. In 1942 (the latest year for which the information is available)[2] no less than 10,406 or 37% of all Canadian manufacturing establishments were working upon agricultural products of Canadian origin. These establishments reported 277,751 employees, a capitalization of $1,191,225,000, a salary and wage bill of $335,108,000, a cost of raw materials of $1,427,517,113 and a gross product value of $2,215,132,914. One only needs to realize the relative importance in this country of

[1] See article by W. C. Hopper in this issue.

[2] *Canada Year Book*, 1945, p. 405.

C.N.R. Photo

The delegation representing the Canadian Federation of Agriculture at the international farm organizations conference in London, England, left Montreal May 2 for the U.K. Members of the delegation are shown outside their special car at the station. Left to right, kneeling, J. S. McGowan, director of colonization and agriculture of the Canadian National Railways, who met the party at Montreal; O. R. Evans, *Family Herald and Weekly Star*, Montreal; W. O. Coon; Fergus Mutrie, supervisor farm broadcasts for the C.B.C. Standing, left to right, R. H. Bailey, president Dairy Farmers of Canada, Edmonton; Hon. D. L. Campbell, Manitoba Minister of Agriculture; Kenneth Betzner, president Ontario Federation of Agriculture; Colin Groff, secretary Canadian Federation of Agriculture, Ottawa; J. E. Brownlee, vice-president United Grain Growers and former Premier of Alberta; H. H. Hannam, president Canadian Federation of Agriculture, Ottawa; Erle Kitchen; R. F. Lick; A. H. Mercer, general manager Fraser Valley Milk Producers, Vancouver; W. M. Drummond, Ontario Agriculture College, Guelph; W. H. Wilmot; J. A. Marion, president l'Union Catholique des Cultivateurs, Montreal; W. H. Porter, *Farmer's Advocate*, London; W. J. Parker, first vice-president of the Canadian Federation of Agriculture and president Manitoba Wheat Pool Elevators, Winnipeg; C. H. Hodge, *Farmer's Magazine*, Toronto.

industries such as slaughtering and meat packing, flour and feed milling, cheese, butter and concentrated milk making, fruit and vegetable canning, sugar refining, or woollen textile manufacturing in order to appreciate the significance of the inter-relationship just indicated. Among the country's forty leading manufacturing industries there are at least a dozen which depend partially or entirely upon agriculture for their raw materials.

Despite the importance of other contributions, it is the part played by agriculture in supplying a market for manufactured goods that is usually emphasized when the interdependence of agriculture and industry is being considered. That agriculture's buying potentialities are important and generally recognized is indicated by the statements of business executives at annual meetings, the attention paid to farming conditions when business surveys are made, and the general tendency to look upon the field crop and price outlook as the best possible indicator of general business conditions. In fact the importance of farmer buying has commonly led to the suggestion that there cannot be satisfactory conditions in industry unless farmers have adequate purchasing power.

Such attitudes and viewpoints are not to be wondered at. It is obvious that the needs and desires of several million farm people, if supplemented by the requisite purchasing capacity, must constitute a vast potential market for manufactured goods. While its actual size was greatly restricted by lack of farm income before the war and by extreme scarcity of goods during the war, information secured from the 1931 census indicated that, in 1930, almost half the domestic market for the products of urban manufacture was provided by Canadian agriculture. Farm purchases bulk large in the national total for the very good reason that farmers have to buy producers' goods of a type and to an extent entirely uncalled for on the part

of the great mass of urban people.

While a large part of the market for manufactured goods as a class is provided by agriculture, it may be noted that, in the case of certain specific industries, the entire, or almost the entire, outlet is the farm outlet. In this connection one might cite the agricultural machinery industry, or the industries manufacturing fence wire, tile, stable fittings, harness, binder twine, farm produce containers, prepared feeds and artificial fertilizer. In addition to buying goods specially designed for farm consumption, farmers share with others in the purchase of building supplies, automobiles and trucks, electrical equipment, musical instruments, house furnishings, clothing, manufactured goods, and a countless variety of other things. One might add that the need for rehabilitating the farm production plant and the desirability of installing modern conveniences in farm homes are currently being regarded as major contributors to full employment in the years immediately ahead.

Another important relationship is that which exists between agriculture and the various agencies which supply commercial and other services. First of all may be mentioned the long list of services which are specifically designed for or performed on behalf of farm people. The veterinary surgeon, the country blacksmith or garageman and the local miller are examples of a class which is almost entirely dependent on farmer patronage. Other classes whose very names suggest the large measure of this dependence include the country school teacher, the country preacher and the country doctor. Indeed, if the various groups which make up the non-farming section of our rural population are considered one by one, their degree of direct dependence upon agriculture will be found to be pronounced. This is especially true of that large group known as retired farmers. These people must normally secure their maintenance either from their own past efforts as farmers or from the present farming efforts of those to whom they have transferred farm properties.

The service industry which probably benefits most from the existence of farming is the type grouped under the heading of transportation interests. When one remembers that hundreds of millions of bushels of wheat are transported annually from the prairie provinces to Atlantic and Pacific ports and thence to all corners of the earth; that around a quarter of the car loadings of revenue freight is composed of grain and grain products and live stock; that the dairy and poultry enterprises supply a large part of the express company business; that the mail-order business is largely confined to country customers; that large and increasing parts of our whole milk, cream, live stock, vegetables and fruit form the stock in trade of the motor truckers; and that all manufactured goods used by farmers must be transported and, generally, over great distances — it is obvious that the dependence of the transportation agencies upon agriculture is pronounced. The fact that farming is mostly of the extensive type and that farmers are spread widely from coast to coast whereas the majority of urban consumers of farm products and manufacturers of farm supplies are located in the central provinces, the fact that so much of the farm produce has to be exported, and the tremendous area of the country itself all make for the movement of large quantities of goods over great distances. The mere fact that transportation charges make up such a large part of total agricultural marketing costs is, in itself, an excellent indication of the degree of dependence of transportation agencies upon agricultural business.

In addition to contributing greatly to the processing and transporting interests, agriculture is really responsible for the existence of all those agencies which perform the various other marketing functions. Those who undertake functions such as grading, packing and sorting, storing, selling and buying, and advertising, all derive benefit. It is not merely a matter of providing all these people with employment. Further employment is provided to the extent that many of the marketing functions require construction and maintenance of special institutional equipment. Such things as stock-yards, cold storage houses, grain exchange facilities, refrigeration cars, and grain elevators, both country and terminal, represent a great deal of building, large scale invest-

ment, and considerable employment. The very width of the various agricultural marketing spreads is perhaps the best measure of the economic importance of the marketing job.

The various financial institutions and those who work in them constitute a further leading beneficiary of farmer patronage. The various capital needs of farmers are met by a corresponding variety of lenders including private individuals, governmental agencies, mortgage, trust and insurance companies and commercial banks. There is no doubt that the amount of business supplied by farmers makes up a considerable part of the total secured by these agencies. The Chartered Banks, for example, loaned nearly 58 million dollars to farmers in 1944. Loan and mortgage companies, trust companies, and insurance companies still do a large part of the farm mortgage lending in the Prairie Provinces and a considerable amount in other sections of the country. Financial concerns benefit also from the purchase by farmers of bonds, stocks and other securities, and various types of insurance policies. The number of farmers taking out life insurance policies has steadily increased, many have hail insurance and the great majority carry some fire insurance. Moreover farmers contribute in an important degree to the savings deposits of commercial banks.

In the spheres of international trade Canada's agriculture has always played a fundamental role. As recently as 1928 and 1929 goods of farm origin actually accounted for more than half (on a value basis) of all Canadian exports. While details concerning exports of recent years are available elsewhere,[1] the general fact is that the great majority of agricultural commodities are normally at least on an export basis while some, like wheat, cheese, bacon, apples and eggs are exported in really large amounts. This is another way of saying that Canada's agriculture plays a large part in determining foreign exchange rates and in supplying the foreign exchange needed to buy the many raw materials and manufactured goods which have to be imported.

[1]See article by Frank Shefrin in this issue.

Summary

A more detailed treatment of this topic would include consideration of several other ways in which agriculture affects the general economic well-being of the country. For example it would stress the fact that, whereas production of manufactured goods tends to drop sharply during depressions, production of farm products has continued remarkably constant through good times and bad. A major result of this is that those interests engaged in the processing and general handling of goods, and hence interested primarily in volume, can place great dependence on agriculture in times when national production of goods in general is declining. To illustrate the point it may be noted that, while the amount of revenue freight carried by Canadian railroads declined between 1930 and 1932 by 37%, only 3% of this drop was due to reduced traffic in agricultural and animal products. This is simply a way of saying that, in times of general economic emergency, agriculture has tended to act as a shock-absorber for the whole economy. It means also, of course, that, during such periods, agriculture has borne a heavier-than-average share of the general burdens incident to depression in the form of much lower than average prices and incomes. Agriculture has continued to absorb labour when industry was stagnant, thereby keeping more people in employment, each doing something of some value. By so doing it has reduced the numbers on relief and made food cheap. At the same time it has seriously lowered the per capita earnings of farm people.

A fuller account would also point out that, since the average farm family is much larger than the city family, the ranks of those in non-agricultural types of activity are continually being replenished by people who are born and raised on farms but are not needed in agriculture. Reference might also be made to the unsheltered character of agriculture, its position and importance in the national price structure, its probable future as compared with that of other major industries, the absolute and relative extent and efficiency of farmer organization, and, in particular, the important part which it plays in formulating the general

(Continued on page 321)

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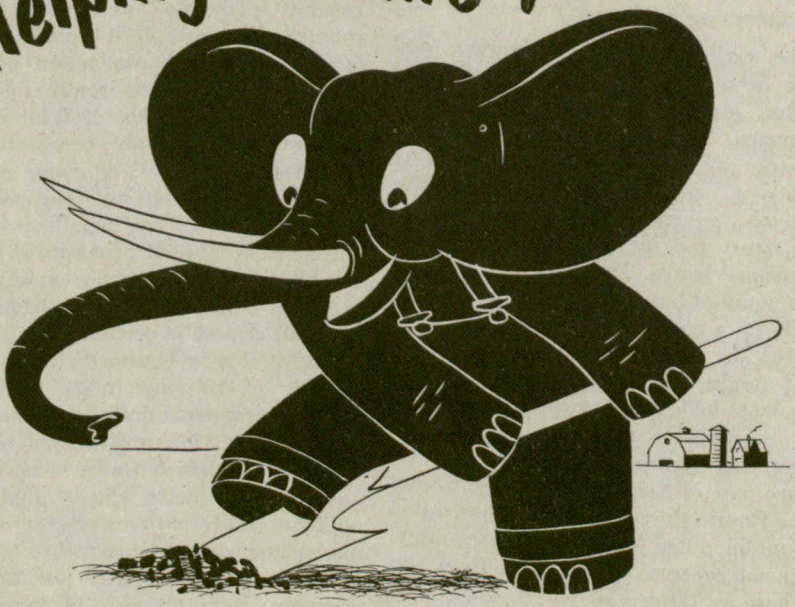

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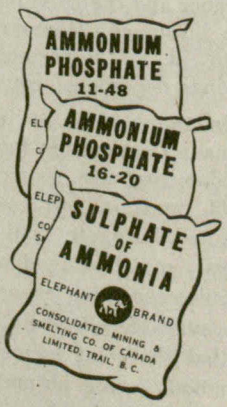

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The Agricultural Soil Resources of Canada

by A. LEAHEY

Soil Specialist, Experimental Farms Service, Ottawa

THIS article deals primarily with the extent and location of the soils in Canada that are or can be used for agricultural purposes. More attention is given to those soils that are suitable for cultivation than to those fit only for grazing purposes.

Arable soils as used in this article include only those soils that can be cultivated with a reasonable expectation of profit under present known, practical management methods and assuming past long time average prices for farm crops. Within certain limits the true extent of arable soils is subject to change with time. For example, poor management practices leading to soil erosion or depletion may change an arable soil into a non-arable one. On the other hand new discoveries in management practices or in better adapted varieties of crops may make it profitable to cultivate land that cannot be cultivated successfully today. Higher relative prices for farm products would also have the effect of putting more land into the arable class.

The area of our agricultural lands does not in itself give a true picture of our agricultural soil resources. Many different types of soils varying in their productivity, adaptability for growing different crops and their management requirements are used for agricultural purposes and a knowledge of their nature and capabilities is essential if one wishes to gain anything more than a general idea of our soil resources. A study of the effect of climate, both regional and local, on the kind and growth of crops is also essential. Space does not permit discussion of these factors here, but the writer desires to draw attention to them.

Soil surveys are being extended and are providing more accurate information on our soil resources. About 45 million acres are suitable for cultivation, in addition to the 89 million acres now producing crops. This additional acreage will be utilized by degrees and will not see the rapid development that characterized the opening up of the prairies.

A. LEAHEY

Any statement of the extent of Canada's agricultural soil resources, and particularly of her arable soil resources cannot be more than an approximation until soil surveys have been made of all areas that have agricultural possibilities. However, soil surveys have been made of a large percentage of our present agricultural areas and the data given by these surveys together with that obtained from other sources makes it possible to give an approximation that may have a reasonable degree of reliability.

Several important physical features decidely limit the possible extent of our arable soils. A large portion of Canada is covered with bare rock and rough land. The Precambrian Shield alone occupies nearly 50% of the total area of the Dominion, the Cordillera occupies about 14% while other rough lands would bring the total area of such lands to 70 or 75%. It is true that important bodies of agricultural land lie within both the Precambrian Shield and the Cordillera, but the great proportion of land there is unfit for farming purposes. Then there are definite climatic barriers in our more northerly regions and in the drier parts of the open prairies. Lastly the great prevalence of swamps and muskegs in much of our forested lands definitely cuts down the possible amount of agricultural land.

The present size of our agricultural plant is shown by the 1941 census of Canada. According to this census the area of occupied farm land was 175 million acres, of which 51% or 89 million acres[1] was being cultivated. Another 30% or 53 million acres was in prairie or natural pasture. While no data were given it

[1] Includes improved pasture.

would seem that several million acres of unoccupied land were also being used for pasture purposes.

While all the land being cultivated in Canada at the present time is not first class land, there is no doubt that it does include the cream of our farm lands in Canada. Probably at least 5% of our present cultivated lands should be retired permanently to grass or woodland, but the remainder can be considered as arable land if properly managed.

The most contentious part of any discussion on our arable soil resources is in the estimation of our reserves. However, from present information it would appear that a reasonably liberal estimate would be about 45 million acres. This, together with our present cultivated acreage of arable soils would place the total arable soil resources of Canada at about 130 million acres. Considering the nature of the vegetative cover on most of our virgin lands it appears likely that our reserves of native pasture land are rather small in comparison with the reserves of arable land.

The estimated figure of 130 million acres for the total arable soils of Canada is one of considerable magnitude even though it is only about 5½% of the total area of this country or about 10% of the total land area of the nine provinces. This is perhaps the better way of expressing the percentage since nearly all the arable land lies within the provincial boundaries. The extent of our arable soils is considerably less than those of the United States. According to the 1938 yearbook of the U.S.D.A., *Soils and Men*, the total arable lands of the United States amount to 447 million acres or 23.5% of the total area of that country.

The distribution of our agricultural soils can be best shown in relation to the major soil zones that have been established as within each zone the dominant soils have certain specific characteristics in common and for the most part these zones coincide closely with the broad climatic and vegetative zone. Hence the type of agriculture that can be practised and the kind of crops that can be grown successfully are closely related to these major soil zones. The location of these soil zones are shown in the accompanying map of Canada.

Brown Soil Zone

This zone covers the drier prairie region of Saskatchewan and Alberta and is characterized by a native vegetation of short grasses. The cultivated land is devoted almost entirely to grain production, particularly wheat. The area of this zone is about 32.5 million acres of which 8 million acres are arable. The present acreage under cultivation here exceeds this figure by some millions of acres and it would therefore appear that some readjustment in land use in this zone is desirable. While only about 25% can be classed as arable land, the remainder is of great value for agricultural purposes as it furnishes excellent pasture when properly managed.

The Dark Brown Soil Zone

This zone covers that part of the open prairies in Saskatchewan and Alberta where moisture conditions are somewhat better than in the Brown Soil Zone. While the type of agriculture and management practices are similar to that of the drier zone, climatic conditions are less hazardous for crop production. Including the shallow Black Zone of Alberta, this zone has a total area of about 35 million acres, of which some 21 million acres are classed as arable. While the land in this zone is well developed some further increase in the present cultivated acreage is possible. In Alberta, where some 16 million acres of this zone lies, it is estimated that there are about 2 million acres of fair to good arable land not yet cultivated. While some further increase in cultivated land may be possible in Saskatchewan, the increase is likely to be considerably less than in Alberta.

The Black Soil Zone

Between the soils of the open prairies and the forest in the Prairie Provinces lies a zone of black soils. These soils have developed under a luxuriant growth of tall grasses and forbs, although at the present time under virgin conditions many of them are under trees and shrubs. Moisture conditions permit a greater diversification of crops than in the brown soil zones. The total area of this zone is about 42

Proper soil conditions, including the presence of plant foods in the necessary amounts, contribute to bountiful crops.

million acres and about 30 million acres could be classified as arable. In Alberta where some 10 million acres occur it is estimated that about 2 million acres are not yet cultivated but in Saskatchewan and Manitoba the percentage of arable land not yet cultivated is probably considerably less.

At the present time well over half of the cultivated land in Canada lies in the above mentioned zones. Most of the native pasture land of good quality also lies in these zones.

The other soil zones of Canada lie within the forested region. The boundaries of these zones have not been determined in most instances as precisely as have the boundaries of the grassland zones. Soil survey information is limited for these forested zones and hence any data given for them is at a higher level of approximation than for the brown and black zones.

The Eastern Podsol Soil Zone

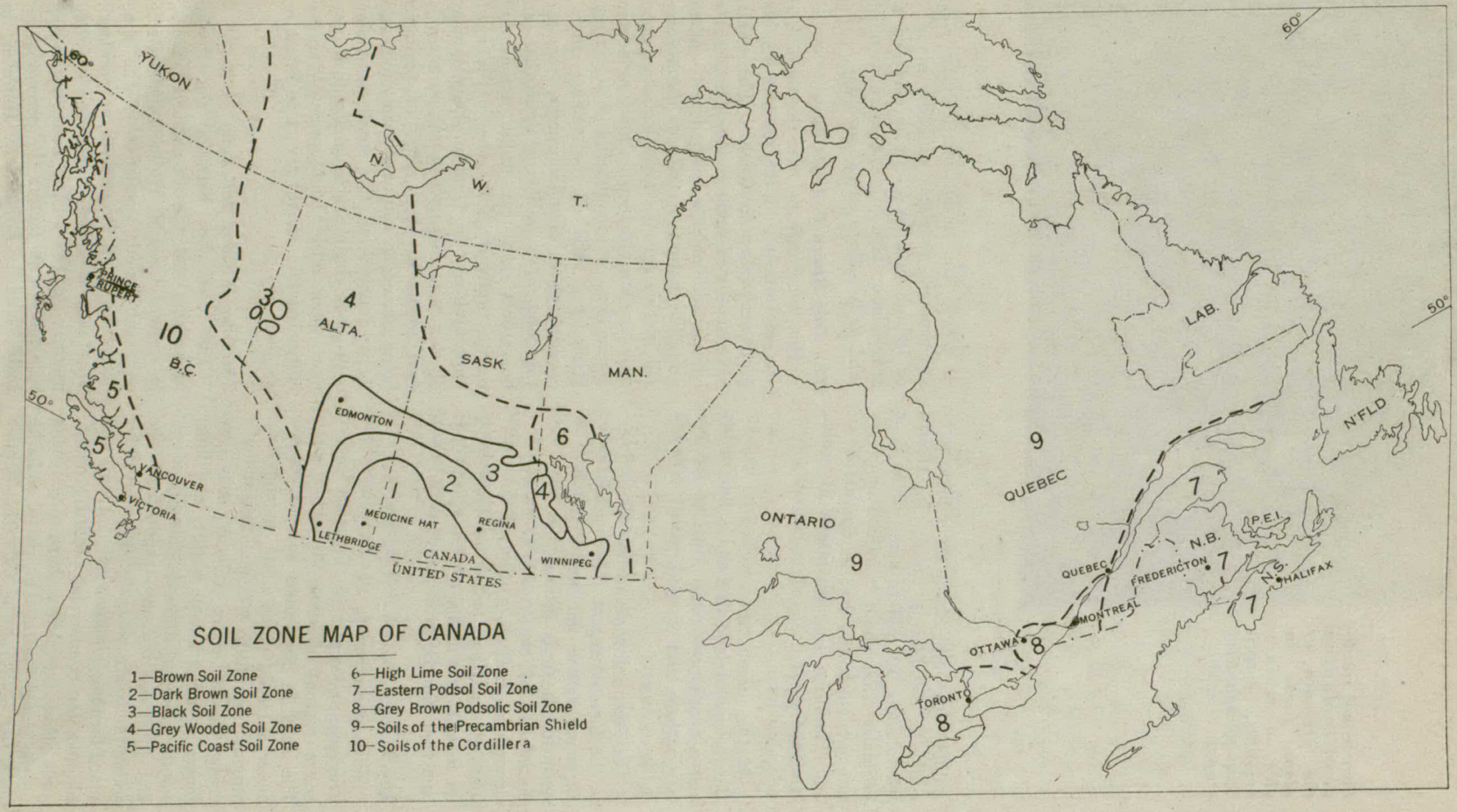
This zone covering the three Maritime Provinces and a portion of eastern Quebec has an extent of some 50 million acres. The soils in this zone have developed under a humid climate, the precipitation ranging from 30 to 40 inches and under a heavy forest cover. These soils are generally rather low in fertility and lime; manure and fertilizers are usually necessary for successful crop production. The arable lands are generally best suited for mixed farming but some soils are very well adapted for commercial potato growing, while others are good orchard soils. Owing to the rough terrain in parts and the nature of many of the soils, the amount of arable land is not great. Under good management practices probably about 9 or 10 million acres could be classified as arable land. This is about twice as much land as is under cultivation today.

The Grey Brown Podsolic Zone

This zone extends over southern and eastern Ontario and the most of the St. Lawrence valley in Quebec. These soils have developed under a humid temperate climate and under a heavy forest vegetation. The natural fertility of the average soil in this zone is fairly high but good responses are obtained on most soils from applications of manures and fertilizers. While it is one of the smaller zones, covering about 25 million acres, from the viewpoint of the variety of crops that can be grown and the total agricultural wealth produced, this zone is the most important one in Canada. Development of this zone for agricultural purposes is well advanced, about 60% of the area being classed as improved farm land, and it is doubtful if the small remaining acreage of virgin arable land will do any more than offset lands presently being cultivated that should revert to forest or permanent grass.

The Grey Wooded Soil Zone

This zone lies between the Rocky Mountains and the Precambrian Shield in western Canada. While the climate is only sub-humid, woods cover the zone except for local occurrences of parkland. This zone is a very large one covering upwards to 150 million acres but owing to a number of factors the percentage of arable land is rather low. However, in


60°
YUKON
N. W. T.
PRINCE RUPERT
B.C.
ALTA.
SASK.
MAN.
ONTARIO
QUEBEC
LAB.
N'FLD
P.E.I.
N.B.
N.S.
50°
EDMONTON
VANCOUVER
VICTORIA
MEDICINE HAT
LETHBRIDGE
REGINA
WINNIPEG
CANADA
UNITED STATES
QUEBEC
FREDERICTON
HALIFAX
MONTREAL
OTTAWA
TORONTO
SOIL ZONE MAP OF CANADA
1—Brown Soil Zone
2—Dark Brown Soil Zone
3—Black Soil Zone
4—Grey Wooded Soil Zone
5—Pacific Coast Soil Zone
6—High Lime Soil Zone
7—Eastern Podsol Soil Zone
8—Grey Brown Podsolic Soil Zone
9—Soils of the Precambrian Shield
10—Soils of the Cordillera

addition to the rather limited amount under cultivation at present this zone does contain the largest amount of potential arable land in Canada. The total amount of such land in this zone would appear to range between 20 and 25 million acres.

The High Lime Soil Zone

This zone lying between Lake Manitoba and Lake Winnipeg and along the western side of the former lake has a very similar climate and vegetation to the Grey Wooded Zone, but the very high lime nature of the parent material has largely prevented the development of a normal grey wooded type of soil. This zone has only a small percentage of cultivated land and the total area of arable soils is low as most of the zone is not suitable for cultivation owing to the occurrence of large areas with poor drainage; coarse textured soils, or the presence of rock close to the surface.

The Pacific Coast Soil Zone

This is a comparatively small zone occurring along the Pacific coast where the winters are mild with a heavy rainfall and the summers are comparatively cool and dry. The older upland soils are relatively low in natural fertility, but there are some important areas of good recent soils. Information is lacking for much of this area but a Soil Survey of the Lower Fraser Valley gives the arable acreage, present and potential, of that area as 318,000 acres. This, however, is the largest block of land in the zone with suitable topography for agriculture. Possibly there may be upwards of three quarters of a million acres of arable land in the entire zone.

Soils of The Precambrian Shield

While the soils of the Shield largely are either of the podsol or grey wooded types it is not possible as yet to zone them in the same sense as those previously mentioned. Most of the Precambrian Shield consists of rough lands with large areas of bare rock or extensive deposits of peat. The agricultural lands are confined to river valleys, to some of the smoother ridges along the southern edge and to rather extensive lacustrine deposits, the most notable of these occurring in the Lake St. John and Abitibi districts in Quebec and the New Liskeard, Cochrane-Hearst and Rainy Rivers in Ontario. Some of the soils on these lacustrine deposits are reasonably good agricultural soils, but poor drainage conditions together with the prevalence of varying thicknesses of muck and peat on the surface of the mineral soil often limit the use of the land for agricultural purposes. Nevertheless these areas do constitute one of our big reserves of arable land and the estimate made here of about 15 to 17 million acres for the total arable lands may be a rather conservative one.

Soils of the Cordillera

The varied conditions within our Cordillera have given rise to such a variety of soils that one cannot zone them on the basis of common characteristics without the use of a large scale map. The great range in climate has permitted a wide diversification of crops in certain areas. Arable land is limited to the rather narrow valleys and to those plateau areas with relatively level topography. While the total area of arable land probably does not exceed three million acres, many millions of acres are suitable for pasture purposes.

In this review an attempt has been made to estimate the acreage of our total arable soils. According to this estimate the total acreage of such soils in Canada is about 130 million acres, 85 million[1] being under cultivation at the present time and 45 million acres being in a virgin condition. In time most of the potential arable lands may be farmed, but their development will be slow as compared with the opening up of the prairies in the early years of this century.

[1]Total less approx. 5% considered not suitable for cultivation.

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Water for Irrigation

by B. RUSSELL

Director of Water Resources, Alberta Dept. of Agriculture, Edmonton

IRRIGATION in Canada must always be confined mainly to that portion of Alberta and Saskatchewan (some 50 million acres) in the Great Plains, low-rain-fall area which stretches all the way from the MacKenzie Basin to Central Texas, known as Short Grass Country. It corresponds closely with the Drought Area, as designated for the purpose of the Prairie Farm Rehabilitation Act, and is largely contained in the Saskatchewan River Drainage Basin.

This article is confined mainly to a review of the water supplies in the above area. Additional water, however, is now and will be used for irrigation in Manitoba, British Columbia and other small areas in Saskatchewan and Alberta. The use of these additional water supplies, with the exception of those in British Columbia, will therefore, first be briefly discussed.

Manitoba

A reconnaissance was made in Manitoba by the writer in 1940 to determine irrigation possibilities in that Province. While it was not difficult to locate possible developments, or sites where it is physically possible, either by gravity diversion or pump, to divert water to considerable areas of land topographically suitable for irrigation, because of lack of precedent it was much more difficult to form an opinion as to the economy of such possible developments. It was concluded, however, that while irrigation on any extensive scale will never be practical in Manitoba mainly because the available water supplies are not adequate for the purpose, there are some small developments, particularly in the southwest portion of the province, which should some day be constructed. These should eventually make a substantial contribution to the solution of the drought problem in Manitoba. The possibilities referred to are mainly along Pipestone, Gainsborough, Antler and Jackson creeks and along the Souris and Assiniboine rivers. There are also some further possibilities on a number of small streams which flow from Turtle Mountain. All of the above are comparatively small streams; the available supplies being limited to spring floods. Supplemented by reservoirs however, which appear to be available, they should furnish sufficient water for small developments.

"To supply water to those lands now believed to require irrigation (some 2,586,000 acres) it will be necessary to not only divert large quantities of water from the North to the South Saskatchewan River but also to create large storage capacity on the streams. The most economical and desirable storage sites are the natural sites consisting of lakes or other large and flat depressions, where large capacities can be created by comparatively low and inexpensive dams. While a number of such sites exist at the heads of the Bow and Athabaska Rivers, the best sites known for combined irrigation and power development are at Buffalo Lake in Alberta and White Bear Lake in Saskatchewan."

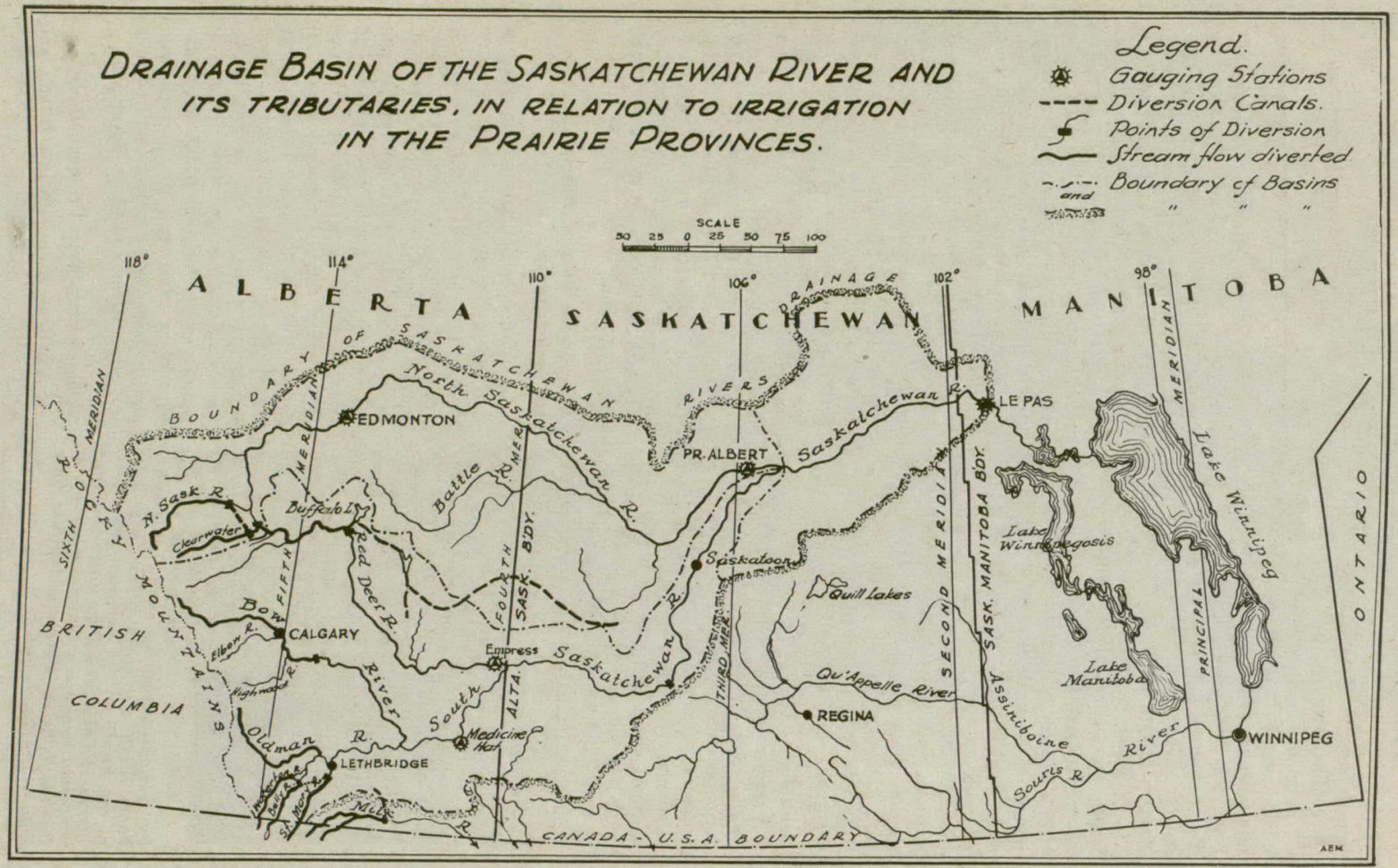
B. RUSSELL

Other Small Areas in Alberta and Saskatchewan

In addition to the streams contained in the Saskatchewan river drainage basin there are a number of others which are of some importance for irrigation. These consist of a number of rivers and tributaries such as the Milk, Qu'Appelle, and Souris rivers and a number of land locked streams which flow from the Cypress Hills. All of these streams are small but despite the fact that they either dry up completely in the summer, or at least become very low, it will be possible by the construction of reservoirs to provide a water supply for some 60,000 acres. The Frenchman river and Maple creek have already been fully developed and some of the other streams partially developed.

Saskatchewan River Drainage Basin

Since large scale irrigation is now and must always be confined to the Sas-


DRAINAGE BASIN OF THE SASKATCHEWAN RIVER AND ITS TRIBUTARIES, IN RELATION TO IRRIGATION IN THE PRAIRIE PROVINCES.
Legend.
Gauging Stations
Diversion Canals.
Points of Diversion
Stream flow diverted
Boundary of Basins
" " "
SCALE
50 25 0 25 50 75 100
118°
114°
110°
106°
102°
98°
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
BOUNDARY OF SASKATCHEWAN DRAINAGE RIVERS
SIXTH MERIDIAN
FIFTH MERIDIAN
FOURTH MERIDIAN
THIRD MERIDIAN
SECOND MERIDIAN
PRINCIPAL MERIDIAN
SASK. MANITOBA BDY.
SASK. ALTA. BDY.
EDMONTON
PR. ALBERT
LE PAS
CALGARY
Empress
Medicine Hat
LETHBRIDGE
Saskatoon
Quill Lakes
REGINA
WINNIPEG
Lake Winnipegosis
Lake Winnipeg
Lake Manitoba
North Saskatchewan R.
Saskatchewan R.
Battle R.
Red Deer R.
Bow R.
Elbow R.
Highwood R.
South Saskatchewan River
Qu'Appelle River
Assiniboine River
Souris R.
Oldman R.
Belly R.
St. Mary R.
Milk R.
N. Sask. R.
Clearwater
Buffalo L.
ROCKY MOUNTAINS
BRITISH COLUMBIA
CANADA - U.S.A. BOUNDARY
AEM

katchewan river drainage basin a brief description of the basin is necessary. The area of the basin above The Pas is approximately 149,500 sq. miles or 95,680,000 acres. This is more than twice the combined area of Nova Scotia, New Brunswick and Prince Edward Island. The area above the confluence of the North and South Saskatchewan rivers is approximately 125,000 sq. miles, the South Saskatchewan river basin some 66,500 sq. miles and the North Saskatchewan river basin some 59,000 sq. miles. Of the 149,500 sq. miles contained in the basin some 82,000 sq. miles are in Alberta, 66,600 sq. miles in Saskatchewan and 900 sq. miles in Manitoba.

The basin contains most of the large centres of population and a large percentage of the agricultural lands in Alberta and Saskatchewan. Water development projects, therefore, if properly planned and co-ordinated must play a very important part in the agricultural and industrial development of these two Provinces and the country generally.

The main streams in the South Saskatchewan river basin are the Waterton, Belly, St. Mary, Oldman, Highwood, Bow, Elbow, and Red Deer rivers. These with their tributaries all join in Alberta to form the South Saskatchewan river. The stream then flows into Saskatchewan where it is joined by a number of small prairie streams mainly from the Cypress Hills, and is again joined by the North Saskatchewan river at a point some forty miles below Prince Albert, to form the Saskatchewan river. From there the stream flows to Lake Winnipeg and thence by the Nelson river to the Hudson's Bay.

The main streams in the North Saskatchewan drainage basin in Alberta are the North Saskatchewan and the Clearwater rivers. These streams with their tributaries join in Alberta to form the North Saskatchewan river proper. In Saskatchewan it is joined by the Vermillion and Battle rivers and other small streams and then joins the South Saskatchewan river below Prince Albert.

Water from the North Saskatchewan river drainage basin can be turned into the South Saskatchewan river drainage basin by means of diversion works located above Rocky Mountain House. At a height of land near the head of the Raven river a low weir on the Clearwater river will divert that stream through to the Raven river and thence to the Red Deer river. By means of a diversion dam some fifty feet in height on the North Saskatchewan river at a point some fifteen miles above Rocky Mountain House water from the North Saskatchewan river can be carried by a canal to a point on the Clearwater river where it can again be diverted through the Raven river to the Red Deer river.

All of the main streams and tributaries in Alberta enumerated above rise in the mountains and discharge large volumes of water which in the foothills can readily be diverted and used for irrigation on the prairies. These mountain streams flow swiftly through the foothills practically on top of the land but immediately they reach the deep prairie soils they cut into them and thereafter flow in deep wide valleys far below the general level of the surrounding country. In this section they cannot be so readily diverted by gravity and pumping to the prairie lands is generally not economical. Most of the mountain water runs off in the spring or early summer as the snow melts in the foothills and mountains so that in order to conserve sufficient water for large scale irrigation very large reservoirs are required on the streams.

At points along the foothills where these streams can be diverted the combined average annual flow is something over eleven million acre feet. The average annual discharge of the South Saskatchewan river at the Alberta-Saskatchewan boundary is about 7,000,000 acre feet and the average annual flow of the North Saskatchewan river at the Alberta-Saskatchewan boundary about 6,142,000 acre feet making a total of 13,142,000 acre feet. The average annual flow of the Saskatchewan river at the Saskatchewan-Manitoba boundary is about 18,000,000 acre feet. Although the accumulated flow in the basin is sufficient for some 9,000,000 acres, if it could all be used, only that portion which can be conserved in reservoirs and diverted during the open water season by canals of reasonable

capacity can be economically diverted for irrigation. It is estimated that to provide for all lands now believed to require irrigation in the drainage basin, some 1,661,000 acres in Alberta and 925,000 acres in Saskatchewan, it will be necessary to create storage capacity to the order of 3,250,000 acre feet and to divert annually from the North to the South Saskatchewan river an average quantity of something like 2,218,00 acre feet.

Allocation to Provinces

The North and South Saskatchewan rivers are inter-provincial streams and require to be administered as such. Streams do not recognize artificial boundaries and, therefore, cannot be satisfactorily and efficiently developed provincially. Any diversion of streams in Alberta for instance may adversely affect the streams and lakes in Saskatchewan and Manitoba. Conversely storage created in Alberta to increase the winter flow for power incidentally must increase the power production capacity for the full length of the stream below. A fair allocation of the flow is, therefore, necessary.

Assuming that a fair estimate of the ultimate development of irrigation in the drainage basin is as stated above (1,661,000 acres in Alberta and 925,000 acres in Saskatchewan) then what effect will such diversions have on the streams as at the inter-provincial boundaries? The writer has estimated this approximately as shown in Table 1.

It will be noted that the effect of the North Saskatchewan river diversion along with the release of storage water accumulated in a high water year is to increase the natural flow in a low or critical year by 8.2% rather than to decrease it.

Conclusion

To supply water to those lands now believed to require irrigation (some 2,586,000 acres) it will be necessary to

(Continued on page 309)

Table 1

At the Alberta-Saskatchewan Boundary — Average Year:			
South Saskatchewan River — Unregulated or natural flow		100	percent
	Regulated flow for irrigation	96.4	"
	Net diversion for irrigation	3.6	"
North Saskatchewan River — Unregulated or natural flow		100	percent
	Regulated flow for irrigation	63.8	"
	Net diversion for irrigation	36.2	"
At the Alberta-Saskatchewan Boundary — Low Water Year			
South Saskatchewan River — Unregulated or natural flow		100	percent
	Regulated flow for irrigation	108.2	"
	Net increase due to release of storage	8.2	"
North Saskatchewan River — Unregulated or natural flow		100	percent
	Regulated flow for irrigation	51	"
	Net diversion for irrigation	49	"
Saskatchewan River at Saskatchewan-Manitoba Boundary — Average Year			
	Unregulated or natural flow	100	percent
	Regulated flow for irrigation	79.5	"
	Net diversion for irrigation	20.5	"
Saskatchewan River at Saskatchewan-Manitoba Boundary — Low Water Year			
	Unregulated or natural flow	100	percent
	Regulated flow for irrigation	68	"
	Net diversion for irrigation	32	"

Cultivated Hay and Pasture Crops and Natural Grazing Lands

by

T. M. STEVENSON and S. E. CLARKE

Dominion Agrostologist, Experimental Farms Service, Ottawa, and Agricultural Scientist in charge of Forage Crop Research, Dominion Experimental Station, Swift Current, Saskatchewan, respectively.

THE production of forage crops now is recognized as one of the most important phases of Canadian agriculture. The increased attention devoted to forage production during the past decade has been due partly to the need of greater amounts of high quality feeds for our increased live stock population, and partly to a change in concept concerning our whole agricultural program. It is realized that there is a need for a definite forage crops—live stock economy involving a greater diversification and a greater degree of stability in agricultural production. It is realized also that the soil is our greatest natural resource, that soil conservation and proper land use are basic to any planned agriculture and that the growing of grasses and legumes affords the best means of increasing and maintaining soil fertility.

Briefly stated: forage crops have four main functions, (1) the provision of feed for live stock, (2) the provision of cash crops, chiefly in the form of seed, (3) soil conservation, (4) proper land use. Large areas, especially in the four western Provinces, unsuited for the production of cereal crops, produce much native hay and pasturage.

Production of Feed for Live Stock

During 1944, forage crops produced in Canada provided feed for a live stock population which included 2,735,000 horses, 10,346,000 cattle, and 3,726,000 sheep. This was an all-time high for cattle and sheep. The amount and value of the principal animal products obtained from cattle and sheep during the years 1941 and 1944 are presented in Table 1.

In this table mutton includes lamb, while pulled wool amounting to 4,150,000 lbs. in 1944 is not included. While these figures represent the chief products from cattle and sheep only the totals are considerable and it is estimated that production in 1945 was still greater. In 1944 Canada's wheat crop was valued at $460,400,000, and that of 1945 at $326,800,000.

In 1944 the pig population was 7,740,000 and live stock marketings and slaughterings set an all-time record for Canada. During the same year nearly one

T. M. STEVENSON

Additional large-scale experiments in re-grassing, water development and other pasture improvement practices, together with more attention to pasture research, would enable us to approach more closely our potential production.

Forage crops increase the fertility of the soil on which they grow. They make profitable use of lands unsuited for other crops, they ensure a more stabilized agriculture, and they provide a substantial increase in the national revenue.

S. E. CLARKE

TABLE 1.

PRODUCTION AND VALUE OF MILK, BUTTER, CHEESE, BEEF (1), MUTTON AND SHORN WOOL IN CANADA IN 1941 AND 1944.

PRODUCT	Net Weight in Pounds		Value in Dollars	
	1941	1944	1941	1944
Milk.....	16,752,823,000	17,604,823,000	206,543,000	320,860,000
Butter.....	380,447,500	352,831,925	121,309,300	120,923,000
Cheese.....	149,926,600	178,982,942	24,204,442	43,157,200
Beef.....	639,409,000	752,465,000	83,826,000(2)	141,365,000(2)
Mutton.....	36,236,000	45,140,000	7,069,000	10,256,000
Wool.....	11,630,000	15,128,000	2,572,000	4,106,000
Totals:	17,970,472,100	18,949,370,867	445,523,742	640,667,200

(1) Marketings converted to cold dressed weight on basis weights reported in "Annual Slaughtering and Meat Packing Industry."

(2) Value per pound of beef and mutton based upon average value at plant as reported in Annual Reports on Slaughtering and Meat Packing Industry.

TABLE 2

ACREAGES AND VALUES OF PRINCIPAL FORAGE CROPS IN CANADA IN 1941 AND 1944.

	Area		Total Production		Gross Farm Value	
	1941 Acres	1944 Acres	1941 Tons	1944 Tons	1941 $	1944 $
Total East. Canada						
Hay & Clover	7,486,000	8,417,000	9,446,000	12,353,000	128,486,000	158,541,000
Alfalfa.....	786,000	859,000	1,658,000	2,185,000	18,686,000	25,530,000
Fodder Corn.	419,200	418,000	4,136,000	4,124,000	14,513,000	15,903,000
Turnips, etc..	163,000	133,000	1,611,250	1,506,200	14,010,000	17,937,000
Total West. Canada						
Hay & Clover	1,622,000	1,703,000	2,799,000	2,749,000	17,742,000	25,099,000
Alfalfa.....	363,000	721,000	829,000	1,598,000	6,984,000	17,365,000
Grain Hay...	1,053,000	733,000	1,416,000	1,325,000	7,544,000	7,905,000
Fodder Corn.	100,000	56,000	523,000	274,000	2,561,000	1,597,000
Turnips, etc..	16,000	14,000	112,850	86,400	1,217,000	1,686,000
Totals for Canada....	12,008,200	13,054,000	22,529,000	26,200,600	211,743,000	271,563,000

billion pounds of meat products were delivered for export.

In order to meet the requirements of this greatly increased live stock population a great amount of feed in the form of hay, pasturage, silage, roots, etc., was required. While, owing to unfavorable climatic conditions, there was a shortage of such feeds in certain areas, there was no serious shortage in Canada as a whole. Grasses and legumes as hay and pasturage constitute the bulk of forage produced. Other crops such as corn, grain hays, sorghum, millet, roots, etc., are grown more or less in certain Provinces, and add greatly to the total amount of feed produced.

The acreages, yields and values of the principal forage crops produced in Canada in 1941 and 1944 are presented in Table 2.

It will be noticed that in eastern Canada, total production and value of these crops was considerably greater in 1944 than in 1941. In the west, although yields per acre were generally lower in 1944, there was an increase both in acreage and total production compared with 1941; the chief increase being in alfalfa. In addition to hay crops grown on cultivated lands, a great amount of native hay is harvested every year, especially in the four western Provinces where many of the ranches depend chiefly on hay of the native grasses as winter feed.

Pastures, both improved and natural, provide a large portion of the feed consumed by our live stock. Such pasturage, harvested by the animals themselves, is the cheapest feed available. The acreages of pasture, both improved and natural, together with those of cereal grains, for the year 1941, are presented in Table 3.

Of the 173,600,000 acres of occupied farm lands in Canada in 1941, approximately one-quarter or 43,647,671 acres were used for the production of cereal grains, and about five-sixths of this acreage was in the three Prairie Provinces. Most of the 8.5 million acres of improved pasturage is found in Manitoba and eastern Canada where moisture conditions usually are favorable. These pastures if properly managed, supply practically all the nutrients grazing animals require with the exception of common salt (sodium chloride). The grasses and legumes while in the leaf stage of growth are highly palatable and nutritious, containing from 15 to 25% protein. On acid soils lime may have to be applied, while in certain cases phosphates or other commercial fertilizers may prove beneficial. Barnyard manure properly applied increases the yield and improves the quality of the herbage. During recent years much attention is being given, not only to the yields of herbage on a dry matter basis, but also to the yields per acre of protein phosphorus, calcium and other nutrients. Such essential nutrients for live stock are obtained more economically from good pastures than from any other source.

While in eastern Canada nearly half of the pasture is on cultivated land, in the

● *An improved pasture in Eastern Canada. Note the predominance of white clover in the mixture.*

TABLE 3

*Acreage of Cereal Grains and Pasture in Canada in 1941

Province	Cereal Grains (Acres)	Pasture			
		Improved (Acres)	Natural (Acres)	Total (Acres)	Percentage Improved of Total
Prince Edward Island . .	186,597	237,062	80,604	317,666	74.63
Nova Scotia	90,974	175,236	731,801	907,037	19.32
New Brunswick	231,996	296,776	364,493	661,269	44.88
Quebec	1,989,081	2,519,354	2,090,823	4,610,177	54.65
Ontario	4,732,366	3,237,865	3,879,182	7,117,047	45.49
Total—Eastern Canada	7,231,014	6,466,293	7,146,903	13,613,196	47.50
Manitoba	5,747,432	455,487	4,823,515	5,279,002	8.63
Saskatchewan	19,120,163	783,901	19,815,940	20,599,841	3.81
Alberta	11,333,459	625,578	18,745,520	19,371,098	3.23
British Columbia	215,603	171,614	1,846,358	2,017,972	8.50
Total—Western Canada	36,416,657	2,036,580	45,231,333	47,267,913	4.31
Total—All Canada . . .	43,647,671	8,502,873	52,378,236	60,881,109	13.97

Note: Forest Reserves used as pasture in British Columbia are not included.
* Agricultural Census 1941.

four western Provinces over 90% is native pasturage. The acreage of improved pasture in the west is increasing; this is due largely to the use of crested wheat-grass and the development of irrigation projects. However, the greater part of the feed consumed by horses, cattle and sheep in western Canada is provided by native pastures. This applies particularly to the ranching areas where live stock graze most of the year. On the short-grass and mixed-grass prairies, the principal grass species are highly palatable and nutritious. In the early leaf stage of growth these grasses contain from 15 to 20% protein, and sufficient phosphorus and calcium to meet the animal's requirements. The grasses on the western prairies cure before the fall frosts occur, and while the percentage of protein and phosphorus drops considerably, they are still quite nutritious, and live stock thrive on such pasturage even during the winter months providing an ample supply is available. While hay or grain is fed during stormy weather or when the snow is deep, especially to young stock such as calves and lambs, most stockmen depend chiefly on the native pastures for feed supplies.

Another important type of pasture not included in Table 3, is that known as "Cover Crops". This practice was developed first by the wheat growers of Alberta for the purpose of preventing soil drifting on fallowed fields during the late fall and winter months. The land is fallowed until the latter part of July and then seeded to cereal grain crops. Usually, considerable growth is made during the fall months and stockmen rent this high quality pasturage in order to put a better finish on live stock taken from their native pastures. Steers usually gain over two pounds a day and total gains of from

● *Hybrid corn bred for high yield of ensilage and grain possesses strong stems which resist lodging and damage from insect pests.*

100 to 150 lb. or more are obtained. During recent years this practice has been a profitable one for the wheat growers and stockmen alike, and further development may be expected.

Pasture Improvement

The net revenue obtained from our 60 to 70 million acres of native pasture together with that obtained from approximately 8.5 million acres of improved pastures is of national concern, since production from this great area is basic to our whole live stock industry. During recent years increased attention has been given to the establishment and management of pastures, yet at the present time actual yields fall far below potential production.

Yields obtained on improved pastures could be greatly increased by the use of better mixtures of grasses and legumes. In many cases a single grass or a mixture of grasses only is used. Many pastures are left down too long and become infested with other inferior grasses and weeds. A greater measure of control is needed to ensure uniform grazing, and to avoid over-grazing. Rotational grazing together with the use of barnyard manure and the application of suitable commercial fertilizers, results in increased production of higher quality herbage.

The production of native pastures can be increased by controlled grazing and proper pasture management. Over-grazing is the chief cause of decreased production. The better grasses are grazed so closely that they cannot produce seed and are eventually killed out. Inferior grasses and pasture weeds come in. In sandy soil areas the grass cover may become so depleted that soil-drifting and water-erosion occur. Proper distribution of water holes and salting places results in more uniform grazing.

On badly depleted native pastures, especially in the lighter soil areas, good results can often be obtained by re-seeding to suitable grasses and legumes. Crested wheat grass has been used very successfully in the dry prairie areas of western Canada. Other grasses and legumes also could be used to advantage in such re-grassing projects. The amount of pasturage could be further increased by the re-grassing of abandoned farm lands and other waste areas.

Production of Forage Seeds

The production of seed of forage plants as a cash crop has reached considerable proportions, and revenue from this source makes a substantial contribution to the national income.

Table 4 (p. 300) includes only the principal species of grasses and legumes grown for hay and pasture in Canada. Seeds of several additional species of annual and perennial grasses are produced in relatively small quantities. To the value of these seeds should be added the annual production of seed corn, both hybrid and open-pollinated, and seed of field roots which together are valued at more than one and one-half million dollars. Considerable expansion in the production of some forage crop seeds is desirable in order to meet domestic requirements and export demands.

TABLE 4

ANNUAL PRODUCTION, VALUE, DOMESTIC REQUIREMENTS AND EXPORTS OF THE PRINCIPAL GRASS AND LEGUME SEEDS USED FOR HAY AND PASTURE IN CANADA.

KIND	Annual domestic requirements. (Ave. 1942-1945 (pounds)	Production 1944 (pounds)	Value of 1944 production (dollars)	Quantity exported (1944-45) (pounds)
Alfalfa	4,318,000	9,570,000	3,347,067	4,979,115
Alsike	3,351,000	1,905,000	539,008	104,122
Red Clover	6,469,000	8,960,000	2,562,410	2,462,303
Sweet Clover	3,974,000	11,892,000	1,070,280	8,880,394
White Clover	54,000	9,700	4,550	—
Timothy	15,165,000	11,096,000	832,200	1,458,000
Brome	—	11,090,000	776,300	6,660,851
Crested Wheat Grass	—	2,365,000	165,550	582,977
Canada Bluegrass	230,000	175,000	35,000	10,220
Kentucky Bluegrass	478,000	25,000	5,000	—
Creeping Red Fescue	232,000	310,000	124,000	82,800
Slender Wheat Grass	—	315,000	22,050	—
Bent grasses, including Red Top	390,000	3,000	1,500	—
Orchard Grass	116,000	17,000	5,600	—
Meadow Fescue	57,000	43,000	13,050	—
TOTAL VALUE			$9,503,565	

Forage Crops Production in Relation to Soil Conservation and Proper Land Use

The soil is Canada's greatest natural resource and the growing of forage crops such as grasses and legumes affords the most practical and effective means of preserving this resource in perpetuity. These crops achieve this objective not only by supplying feed for live stock, but also through their direct influence upon both the physical condition and chemical composition of the soil.

Grass roots add fibre and organic matter to the soil. Most of the roots of grasses are in the surface foot of soil where they are most needed. These roots bind the soil particles together, thus preventing erosion by wind or water. In heavy impervious soils they tend to open up the soil, thus allowing water to penetrate more readily. Organic matter contributed by both grasses, and legumes, increases the water-holding capacity of the soil. Plant nutrients added to the soil, particularly the nitrogen contributed by alfalfa, preserve the fertility of the soil and improve it for the production of cereal grains and other crops.

It is a significant fact that the principal wheat production areas in the Prairie Provinces formerly were open grasslands. In the December, 1945, issue of the *Agricultural Institute Review*, Dr. E. S. Archibald presents very significant data concerning the decline in wheat yields

during the years 1933-42 as compared to those of 1923-1930, and also to the long-time average. The figures presented show a decline in yield of "wheat after fallow" and a greater reduction for "wheat after wheat" at all of the Experimental Stations listed, the decline being least in the black soil areas and greatest in areas having a brown soil type. It is evident that eventually it will be necessary to include grasses and legumes in the rotation in order to maintain the fertility of the soil and the yields of cereal grain crops. This will lead to the production of more live stock and a greater degree of stability in agriculture.

Throughout Canada there are millions of acres of actual or potential agricultural land that are marginal or submarginal for the production of cereal crops. While such conditions exist in all of the Provinces, the greatest areas are located in the drier portions of western Canada where owing to insufficient rainfall or roughness of topography, the native grass is the most profitable crop we can produce.

In some cases these short-grass prairie lands were plowed up in an attempt to grow cereal crops. In most cases the attempt failed, the lands were abandoned, and left to grow weeds. Some of these abandoned lands gradually reverted to the natural grasses, while during recent years others have been re-grassed artificially and converted into good pasturage. These grasslands are now producing great numbers of high-quality live stock.

Forage crops increase the fertility of the soil on which they grow. They make profitable use of lands unsuited for other crops, they ensure a more stabilized agriculture, and they provide a substantial increase in the national revenue.

Top: Typical native grassland on the Canadian prairies.

Centre: Crested wheat grass provides good pasture in the drier prairie areas.

Bottom: Hay from crested wheat grass.

It takes good soil to produce good crops

The same methodical spadework and careful nurturing that lies back of any good crop goes into the selection of **EATON** branded lines. (You'll find them in **EATON** catalogues and other **EATON** advertising.) In the fertile soil of sound judgment these famous names have reached a round ripe maturity that characterizes and lends distinction to the products they identify.

For **EATON** branded lines owe nothing to happenstance. Before being entrusted to bear an **EATON** "badge of merit" they must pass strict examinations. They must prove to be of better-than-average quality and value, as the name that has been given to them signifies.

When shopping decisions are difficult, comparisons hard to draw, it's nice to have **EATON** brands to rely upon (whether in **EATON** catalogues or any other **EATON** advertising). At all times they stand ready to guide you — ruggedly maintaining their reputation for dependable quality and a vigorous money's-worth. You may buy with confidence the wares that wear them.

THE T. EATON Co LIMITED

Cereal Grains

by L. H. NEWMAN

Dominion Cerealist, Experimental Farms Service, Ottawa

The cereals produced annually in Canada constitute one of our most valuable assets. The high place they hold has been attained in no small degree by man's ability to overcome natural handicaps. If this place is to be held we must be prepared to meet other problems, some of which are pressing.

THE economic development of Canada is closely interwoven with the production of grain, notably wheat. Wheat has been aptly described as "the economic fairy of the industrial and commercial life of Canada having built practically the whole economic structure of the Prairie Provinces". No other natural product has been able to compare with wheat as a vitalizing influence upon the life of the Dominion and nothing has attracted so much attention from the outside world.

As may be noted in Table 1, the gross value of wheat is almost as great as the combined values of oats, barley and rye. It will also be observed that wheat plays an infinitely greater role in export trade than do the other cereals. As an exporter of wheat, Canada actually stands in a class by herself.

L. H. NEWMAN

The rise to prominence of Canada as a wheat producer is due largely to the fact that nature has seen fit to give the great prairie sections of this country the sort of climate and type of soil that make for quality as well as quantity. The quality of Canadian wheat has long since come to be recognized as the standard of excellence in the Old Country markets where 'strong' wheats are sought for blending purposes. As a result, our wheat is in "demand", a fact which constitutes one of our great national assets.

Another factor which has contributed enormously in bringing Canada to the very forefront as a wheat producer is to be found in the work of the plant breeder. Indeed, to him is due very largely the credit of making it possible to grow wheat at all successfully over vast tracts of country, at one time thought to be quite 'beyond the pale'. The varieties available to the farmer in the early days required too long a period to mature to be grown with any degree of safety over a very large proportion of the area now devoted to wheat growing and as a result any appreciable expansion, especially in a northerly direction, was exceedingly risky. But early-maturing varieties were not enough, for nature launched another challenge and the dominion of man over his hard won wheat lands was threatened by another enemy. And that enemy was the

TABLE I.

VALUATION OF AGRICULTURAL PRODUCTS

(*From Canada Year Book — 1945*)

	Years	Total Agricultural Products	All Grains exclusive of Wheat	Wheat only
	(ave.)	$ (000)	$ (000)	$ (000)
Gross value	1942-43-44	2,287,581	396,954	378,013
Cash income	"	1,418,266	73,411	296,418
Exports	"	800,672	70,084	246,808

● *Harvest time.*

dread disease commonly known as rust.

The victory won by the plant breeder, in co-operation with the plant pathologist, over this second great enemy of the wheat grower has been recorded elsewhere so need not be repeated here.[1] It is sufficient to say that the hazard of rust appears to be very largely a thing of the past.

The Milling Industry

Wheat production in Canada is inseparably linked with the milling industry. The latter goes back to the early days of pioneer settlement when wheat was grown to furnish flour for succeeding generations of young Canadians. As wheat production expanded, so did our milling facilities until, in course of time, more flour was produced than was required for home consumption. Flour markets abroad, accordingly, were sought and soon the foundation was laid for a large and flourishing export trade in flour. By 1928 the number of flour mills in Canada had reached 260 with a daily capacity of 121,000 barrels. Owing to adverse conditions in the grain trade, exports for the next ten years fell off rapidly reaching the low level of 3,911,886 barrels in 1938. In spite of this, however, Canada continued to be one of the world's largest flour exporters.

During the recent war, an enormous demand from Britain and other allied countries for "all the flour that could be produced", stimulated maximum production with the result that exports increased rapidly. Thus in 1943 no less than 12,896,995 barrels of flour were exported out of a total Canadian production of 23,986,769 barrels. According to the Bureau of Statistics, the total value of the products of the flour and feed industries amounted to $201,127,291 in 1943. Of this, flour accounted for $112,345,014. Chopped feeds, to the value of $47,251,873 produced by some 871 establishments came next, followed by shorts and middlings valued at $12,148,950. Prepared stock and poultry feeds that year were valued at $11,508,843 while bran reached a valuation of $8,045,780.

In appraising the national importance of cereals, other things must be considered besides the mere value of the goods produced. Capital invested, persons employed and salaries paid must also be taken into account. According to statistics, the capital employed in the milling and feed industries in 1943, was approximately $70,869,815 while the total cost of all materials, including containers, amounted to $169,488,532. The administrative and clerical staffs required in connection with the two industries amounted to 2,218 persons while the number of other wage earners totalled 4,945. The pay roll in 1943 reached $10,015,738.

The Baking Industry

The baking industry of Canada also has become big business. Before the war it ranked third in number of persons employed and sixth in the amount of salaries and wages paid. In 1943, about 3,000 concerns were involved with a capital investment placed at $57,067,417. The number employed reached a total of 26,829 persons calling for a pay roll of $32,891,060;

[1] See "New Wheat Creations and Their Significance to Canada", L. H. Newman, *Canadian Geographical Journal*, April, 1939.

Getting Along

SQUABBLING, bickering, scolding, but still making substantial progress, the United Nations are lumbering ahead.

The threat of famine over a great part of the world has convinced the stubbornest of politicians that unless nations work together they may starve together. Hunger is now as great a menace to humanity as the atomic bomb.

First of the United Nations Organizations to get under way, Food and Agriculture finds its program to free the world from the fear of want, enormously aggravated by food shortages in Europe greater than anticipated, the threatened failure of the crops in India, the rapid disappearance of wheat supplies in the exporting countries.

The immediate task of the members of the Agricultural Institute of Canada is to assist with their technical knowledge the production program of Canadian farmers to help meet the world food emergency. A second task that may loom up before producers are prepared for it is the possibility that within a brief period there may emerge over-production of cereals in the exporting countries. This overproduction or under-distribution will require wise, long-term policies so that the consumer will receive his food at reasonable prices in years of scarcity and the producer be paid a fair price in years of plenty.

NATIONAL BARLEY CONTEST

for Seed and Malting Quality Improvement

Sponsored by the

Brewing and Malting Industries of Canada

A serious barley production situation resulting from an extreme shortage of seed and steadily deteriorating quality faces Canada. The National Barley Contest is being conducted to help overcome this situation.

$25,000.00 in Cash Prizes

To encourage the growing of improved quality Seed and Malting Barley in 1946, $25,000.00 in prizes has been donated by the Brewing and Malting Industries of Canada. By stimulating quality barley improvement Canada's domestic needs will be met and successful re-entry into world barley markets will be assured in the future.

INTERPROVINCIAL - PROVINCIAL REGIONAL AWARDS

The National Barley Contest will be divided into two separate competitions—a Western competition for the malting barley areas of Manitoba, Saskatchewan and Alberta (including the Peace River block of B.C.) and an Eastern competition for the malting areas of Ontario and Quebec. In each division, Interprovincial, Provincial and Regional awards will be made with prizes given to the farmers producing the best barley in the following varieties: OAC 21, Mensury (Ottawa 60), Olli and Montcalm.

All bona fide farmers in the recognized malting barley areas in each division will be eligible to compete; farms supported by government or commercial organizations are excluded.

Final date of entry is June 15th. For additional information and entry forms write to

NATIONAL BARLEY CONTEST COMMITTEE

Eastern Division: 1390 Sherbrooke St. W., Montreal

Western Division: 206 Grain Exchange, Winnipeg

● *Wheat! Bread for the hungry peoples of the world.*

the selling value of the baked goods produced amounted to $120,445,625.

Other Facilities Involved

In addition to the milling and baking industries involved, other large enterprises enter the picture. First of all, we have the huge plants which have been built up for the manufacture of agricultural implements—the machines used in cereal production. These give employment to a large army of workers while the pay rolls run into vast sums. Then follow the transportation facilities, including elevator accommodation with all that they imply in the way of capital investment and in furnishing employment to large numbers of people. On December 1, 1940, the total licensed capacity of grain elevators is given as 423,000,000 bushels. Annexes built later added 86,000,000 bushels. By December 1st, 1944, the total elevator capacity in Canada had reached 596,000,000 bushels.

Potential Expansion of Wheat Production in Canada

The future expansion of wheat production in Canada will depend, in no small measure, upon the success of the plant breeder in developing better varieties. Still earlier varieties of high yielding capacity and varieties which are better able to cope with drought would probably add appreciably to the annual output. The advent this year of a new wheat variety capable of resisting the wheat stem sawfly promises to be a development of great and far-reaching significance. Other promising varieties possessing characteristics which are likely to make them particularly useful are also in the offing.

Better varieties of winter wheat and of soft white spring wheats suitable for special trades will also be available shortly. These may contribute considerably to the sum total. Better cultural practices, including the use of chemical weed killers, may add still further to annual production.

The Place of Wheat in Human Nutrition

While wheat is used for the manufacture of breakfast foods, alimentary pastes and other products, its chief use is for the production of flour for the making of bread. And in this connection, it appears safe to say that no other single product contributes so large a precentage of the elements considered essential in our daily diet. While bread supplies valuable minerals and vitamins, its greatest function is regarded by nutritionists to be that of producing energy. The average daily consumption of bread and other cereal products is considered sufficient to supply approximately 25% of the calories or energy units required in what might be considered a good diet. While the energy value of bread does not vary greatly in the different types of bread commonly used, other valuable constituents, notably

protein, iron and vitamin B_1 may show quite wide differences. This has been demonstrated by Whiteside in studies of flours of different extractions.[1]

Cereals Other Than Wheat

While wheat remains the most important single grain by reason of its almost universal use as human food, oats and barley and, to a lesser extent, rye hold first place as a group from the standpoint of animal nutrition. In gross value they actually excel wheat to a slight extent (see Table 1). They do not, however, play a very important part in international trade as they are largely consumed in Canada by farm animals.

Oats

In feeding value for live stock, oats hold a very high place. They rank first in popularity as a horse feed and stand high as a food for cattle. They actually constitute the basis of most of the grain feeds used in Canada and may be regarded as our most important feed grain.

As human food, oats, chiefly in the form of porridge, have always enjoyed wide popularity as a nourishing and palatable food. Ranking high in vitamin B_1 they are in a position to make a substantial contribution to our daily intake of this important vitamin. According to the latest milling returns available, oatmeal and rolled oats produced in 1943 had a valuation of $3,743,738.

New rust resistant varieties, now being introduced, are destined to make oat-growing in Canada a safer and more profitable occupation and thus to place the crop as such on a still higher level among our great natural assets.

Barley

The acreage devoted to barley in the different provinces is shown in Table 2. In the Prairie Provinces barley is preferred to all other crops as a so-called 'cleaning crop' in the fight against weeds. Maturing early, the varieties commonly grown may be sown relatively late without too great risk from frost. Recently it has been found that certain early ripening varieties, sown early on summerfallow in areas particularly subject to drought, may escape the full impact of the latter and yield reasonably good returns. This discovery may prove of very great value to the area concerned. It may also have the effect of increasing the area seeded to this crop in these sections.

As a hog feed, barley holds first place

[1] See "The Place of Canadian Cereals and Cereal Products in Nutrition", A. G. O. Whiteside, *Food in Canada*, December, 1942, page 36.

TABLE 2.

AREAS DEVOTED TO LEADING CEREALS IN 1945

(*From Canada Year Book*)

	Wheat	Oats	Barley	Rye
	(ac.)	(ac.)	(ac.)	(ac.)
Prince Edward Island	4,000	119,000	13,700	—
Nova Scotia	1,300	68,200	10,000	—
New Brunswick	2,400	202,000	13,300	—
Quebec	23,400	1,654,000	133,000	—
Ontario	711,000	1,522,000	305,000	67,500
Manitoba	2,132,000	1,697,000	2,139,000	26,000
Saskatchewan	13,610,000	5,717,000	2,672,000	259,000
Alberta	6,824,000	3,335,000	2,048,000	125,000
British Columbia	106,000	79,000	16,500	1,200
Canada	23,414,100	14,393,200	7,350,500	487,000

in the opinion of most Canadian authorities. It also is well liked when mixed with oats as a cattle food. During the crop year 1942-43 it is estimated that approximately 145,000,000 bushels of barley, in one form or another, were fed to live stock in Canada. During the same period about 33,000,000 bushels were shipped to the United States but this presumably was used for malting purposes.

The malting industry of Canada also provides a market for substantial quantities of certain barley types. Last year it used about 8,000,000 bushels.

Milling returns for 1943 give the valuation of barley flour and meal produced in 1943 as $415,034. Pot and Pearl barley, as processed in Canada in 1943, is credited with a valuation of $165,458.

Rye

Rye is a relatively unimportant though useful crop in Canada. It is valued chiefly as a cover crop in orchards and in tobacco districts in the east while in western Canada it is grown as a cash crop under conditions where other cereals could not be expected to thrive.

Both fall rye and spring rye are grown but the former occupies about twice the acreage of the latter. The largest acreage is found in Saskatchewan followed by Alberta.

As a live stock food, rye is not held in great esteem when fed alone but when used with other grains it is quite highly valued.

IRRIGATION . . .

(Continued from page 294)

not only divert large quantities of water from the North to the South Saskatchewan River but also to create large storage capacity on the streams. The most economical and desirable storage sites are the natural sites consisting of lakes or other large and flat depressions, where large capacities can be created by comparatively low and inexpensive dams. While a number of such sites exist at the heads of the Bow and Athabaska Rivers the best sites known for combined irrigation and power development are at Buffalo Lake in Alberta and White Bear Lake in Saskatchewan. These sites are ideally situated for the co-ordinated development of irrigation and power, and by reason of the possible diversions—first of the Clearwater River and then the North Saskatchewan River—they lend themselves to a plan of progressive development corresponding to the progressive requirements of the power markets and irrigation demands.

GOVERNMENT

OF THE

PROVINCE OF ALBERTA

DEPARTMENT OF AGRICULTURE

AGRICULTURE is the foremost industry of Alberta. A variety of soil types and climatic conditions results in a diversity of production. Alberta bears the distinction of being the second largest producer of grain and of live stock in Canada.

Forty-eight and one-half percent of Alberta's population live on farms which are "fully owned" by 62.5 percent of the operators.

The total area farmed in Alberta is over 43,000,000 acres; it is estimated that 14,000,000 acres of uncultivated arable land are still available.

To utilize the agricultural resources and to administer its various services and policies the Province employs a staff of about seventy technical agriculturists, which partially meets the manifold problems of the industry.

HON. D. B. MacMILLAN,
Minister

O. S. LONGMAN,
Deputy Minister

Fruits and Vegetables

by M. B. DAVIS

Dominion Horticulturist, Experimental Farms Service, Ottawa

M. B. DAVIS

THE fruit and vegetable industry of Canada has expanded in the last twenty years at a rapid rate and covers a wide range of crops. In fruits, Canada produces, in commercial quantities, apples, apricots, pears, peaches, plums, cherries, grapes, strawberries, raspberries blackberries, currants, gooseberries, cranberries, loganberries and, recently, blueberries. In vegetables, a full line of crops is grown under various conditions in practically every province in the Dominion.

Unfortunately, satisfactory statistics are not available for much of this period so it is not possible to present a graphic portrayal of this growth. Data available from the Bureau of Statistics at Ottawa indicate that for the year 1944, the value of all fruits and vegetables was in the neighbourhood of $113,780,000 made up as follows:

All fruit	$ 40,745,000
Cash income from vegetables other than potatoes	37,446,000
Value of potatoes	35,589,000
	$113,780,000

In terms of acreage based on the 1941 census in the case of fruits and the 1944 production figures for vegetables the statistics are as below:

	Acres
Acreage in apples	131,998
Acreage in all other fruits	81,610
Acreage in potatoes (1945)	507,600
Acreage in other vegetables	181,510
Total	902,718

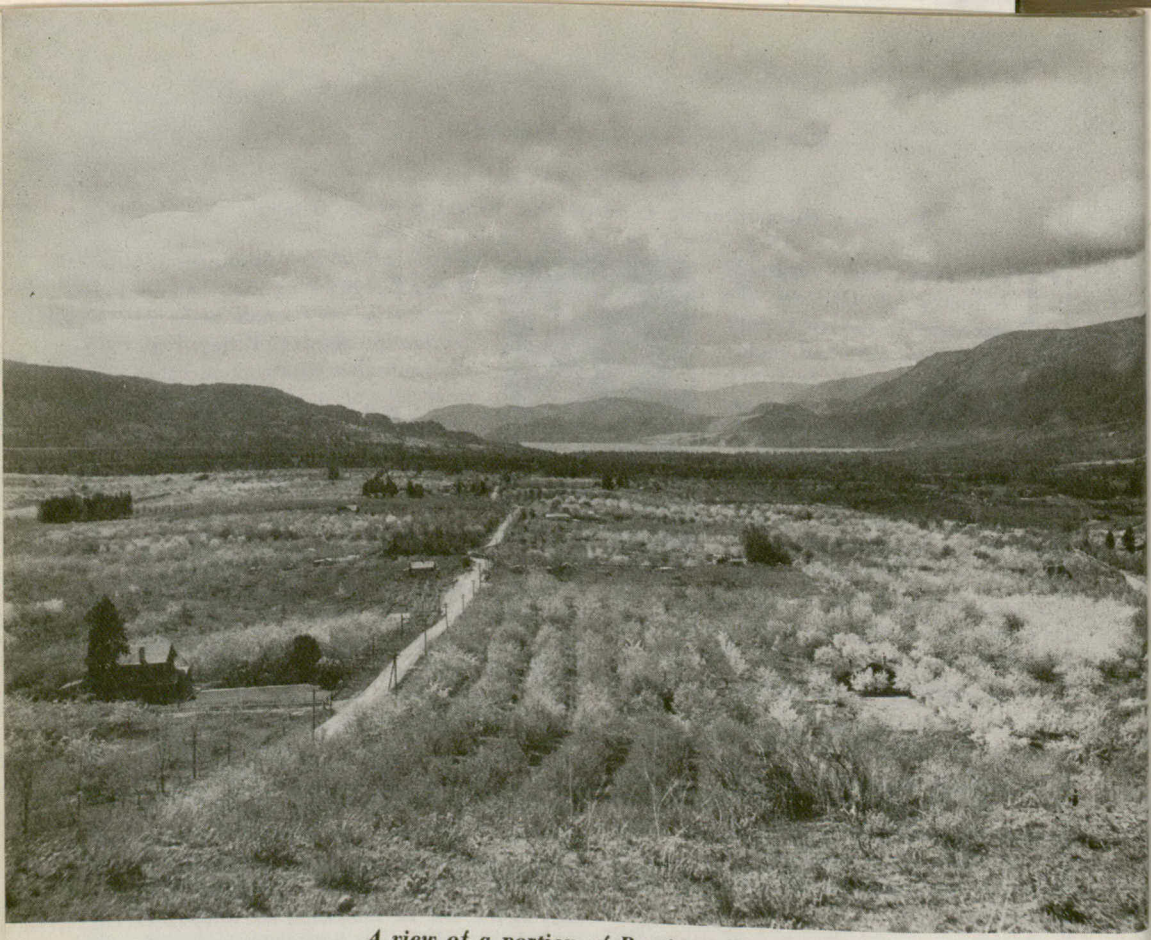
Fruit Production

Space does not permit of a detailed analysis of the above and other pertinent data, but a few of the more important aspects of the present situation and future possibilities might be considered. Until recently, say the last twenty-five years, the apple industry of Canada was largely centred in Ontario and Nova Scotia, with the older provinces of New Brunswick and Quebec occupying a very small place in production figures. Today British Columbia outstrips all other provinces on actual production, with Nova Scotia occupying second place, Ontario third, Quebec fourth and New Brunswick a poor fifth.

In potential production for the next ten years, based on planted acreage, Nova Scotia and British Columbia are about equal, while Ontario with heavy new plantings, is in the lead, having double the British Columbia acreage. Quebec alone has acreage planting equal to British Columbia. Thus the stage is set for a tremendous increase in apple production in Canada in the next ten to fifteen years. The average production at present is around 12,000,000 bushels per year and, barring unforeseen disasters, it might be conservatively estimated that this figure will be increased to 20,000,000 bushels in the not far distant future. Either Canada will have to eat more fruit per capita, export more, or increase in population to take care of this potential production.

In the tree fruits the peach crop comes next to apples in importance with a total acreage of over 20,400 of which 17,735 is located in Ontario and the balance in British Columbia. British Columbia is a newcomer in this industry, where the production is located in the southern half of the Okanagan Valley. Judging from results to date the industry is there to stay and will grow to much larger proportions. In 1941 there was a total in Canada of 1,021,364 trees under five years of age, of which 906,895 were in Ontario and 105,469 in British Columbia. With Ontario producing at present about twice the quantity of peaches produced in British Columbia and possessing about nine times as many young trees one would expect a considerable increase in this commodity in the immediate future.

Our next greatest acreage is that of pears which, in 1941, accounted for 9,487 acres:—6,111 in Ontario, 2,847 in British



A view of a portion of Penticton Bench, B.C.

Columbia and only 451 in Nova Scotia. Canada has never been self-supporting in pears, importing from 200-300,000 bushels per year, enough to warrant the planting of another three or four thousand acres to take care of present requirements. The pear industry of Nova Scotia has recently commenced to grow, having more than doubled in the last ten years. There would appear to be opportunities for further expansion in the immediate future.

While the commercial production of plums only accounts for some 7,595 acres, largely concentrated in Ontario and British Columbia, it is the most widespread tree fruit in Canada, being grown in every province of the Dominion. In British Columbia the greatest production is with the prune type although they are largely used in the fresh fruit trade and to some extent as a canned product.

The cherry industry, which accounts for some 6,257 acres, is likewise concentrated in Ontario and British Columbia. In this latter province a healthy processed cherry industry has developed, supplanting in a large measure the importation of Maraschino cherries and glacéd cherries from abroad.

Dealing with fruits other than tree fruits, we find 17,506 acres in grapes, mostly at present in Ontario which accounts for 16,874 acres of the above total. The balance is practically all in British Columbia which is new to this industry but where increasing plantings are taking place, thus indicating an expansion in grape production in the immediate future.

Raspberries and strawberries, the two most important small fruits, make up to over 16,000 acres with Quebec, Ontario and British Columbia taking care of the bulk of production, although Nova Scotia and New Brunswick have sizable acreages and have definite opportunities of expansion. Other fruit grown in smaller acreages but totalling close to 2,000 acres are blackberries, currants, cranberries, loganberries, gooseberries and blueberries.

In looking to the future of the Canadian fruit industry, one is struck by the trend towards a shift in apple production to the more severe parts of Ontario and Quebec, which, due to the advent of the McIntosh variety and, later, to the more adaptable varieties of the plant breeding institutions, are more than competing for their share of the markets. Added to this is the recent adoption of hardier rootstocks and better tree building technique, all of which assures for these regions a permanent and expanding production.

Another fruit recently introduced to cultivation is the blueberry and an infant but flourishing industry is being established in the peat lands of Lulu Island in British Columbia. It is not too much to expect this to develop into a crop fully equal to the production of strawberries in acreage and value. While large scale commercial production has been limited to the provinces other than the three prairie provinces, there is a small but expanding effort in this region towards commercial production of crabapples, hardy plums, and small fruits.

Vegetable Production Including Potatoes

Whilst every province in Canada produces vegetables in appreciable quantities the largest acreage is concentrated in Ontario and Quebec. The distribution of the vegetable and potato acreage is worthy of note and is set forth below:

ACREAGE PLANTED TO VEGETABLES, 1944

	Vegetables other than Potatoes	*Potatoes*
Prince Edward Island	—	39,000
Nova Scotia	—	25,000
New Brunswick	—	66,900
Maritimes	3,960	130,900
Quebec	45,830	168,900
Ontario	106,970	120,000
Manitoba	—	27,800
Saskatchewan	—	41,600
Alberta	—	28,700
Prairies	10,190	98,100
British Columbia	14,550	17,000
Canada	181,500	534,900

To the provinces of New Brunswick and Prince Edward Island the potato crop is of greater importance than to any other province in Canada. This is because the returns from potatoes constitute a large part of their agricultural revenue. These two provinces are definitely on an export basis, largely to the Ontario and Quebec cities. In so far as other vegetables are concerned, we find the bulk of our tomato production in Ontario with an appreciable acreage in Quebec and British Columbia. These three provinces will always produce the bulk of this crop owing to climatic conditions, but British Columbia could very easily increase its acreage if the demands require it. For many years the pea canning industry was concentrated in Ontario, then, it spread to southern Quebec and still more recently to British Columbia and the irrigated sections of southern Alberta. One might expect a marked increase in the Alberta acreage as their soil and climate is particularly adapted to this crop, where it encounters less difficulty from climatic vagaries and certain diseases and insect pests.

The Maritimes, which for years never figured to any extent in the vegetable processing industry, have, during the last ten years, become actively interested, particularly in Nova Scotia and one can look forward to a considerable growth in the processing of all vegetables, excepting tomatoes, in that region of Canada.

For many years the bulk of Canadian grown vegetables was produced by mar-

An orchard at the Dominion Experimental Station, Morden, Man.

ket gardeners on comparatively small holdings, who relied on large quantities of manure for the maintenance of their fertility. While no figures are available to indicate the trend it is known that for some time the production of many staple vegetables has been associated with large tracts of land where farmers specialize on a few crops in considerable acreage and ship long distances. Such a system permits of better farming practices, especially where manure is becoming less readily available.

Recently, however, due to higher prices and the desire of many people to work small holdings, there is a trend back again to the smaller scale production. One would expect in the end, however, that economics will once again force the trend towards larger scale operations where greater mechanization can play a part and where proper rotations and better farming practices can operate.

Of the four canning crops reported by the Bureau of Statistics, viz., bean, corn, pea and tomato, we find a total acreage of 144,970, of which 123,484 acres were for canning purposes. It can be taken for granted that this latter figure represents production from large holdings rather than from market gardens. It is also seen that the big bulk of the vegetable acreage reported is destined for the processing industries.

Vegetable Seed Production

Prior to World War II Canada's vegetable seed industry was a struggling infant. There was a well established pea seed production industry in Alberta and a well organized but small effort toward general vegetable seed production in British Columbia with a few interested individuals here and there in eastern Canada. Fortunately this small effort was organized around the services of the Canadian Seed Growers' Association and the services of the Federal and Provincial Departments of Agriculture. Furthermore, the basis of production was quality and adaptability of strains, supported by good foundation stocks, careful inspection and control. With the advent of war and the cut-off of imports our vegetable seed production was stepped up tremendously to take care of home and export requirements. While no statistics are available it is doubtful if the value of our vegetable seed crop in 1939 exceeded three to four hundred thousand dollars. By 1944 this had increased to $2,472,395 which represents a total production of 17,388,805 pounds of seed.

This production is distributed over the whole Dominion. The total amounts, including onion sets, for each province are set forth below:

Maritimes	3,425 lb. seed
Quebec	335,175 lb. seed
Ontario	1,421,905 lb. seed
Ontario	1,513,000 lb. onion sets
Manitoba	777,985 lb. seed
Manitoba	4,000,000 lb. onion sets
Saskatchewan	340,000 lb. seed
Alberta	6,028,000 lb. seed
British Columbia	2,940,315 lb. seed
British Columbia	29,000 lb. onion sets

The Alberta production is mainly peas, but the irrigated lands of southern Alberta lend themselves to cheap production of seed crops of beet, spinach and radish. It will be noticed that aside from Alberta, British Columbia has the heaviest production of seed proper. It is the only province which produced a full line of the twenty kinds recorded. The vegetable seed industry proper is well organized in British Columbia and is particularly adapted to that part of the country. While it might be too much to expect that we can retain all our present export business, efforts are being put forth to retain a respectable share of it on the basis of the highest quality of pedigreed material, and so the baby of Canadian horticulture has come of age and shows signs of a healthy and useful life in the Canadian economy.

● *Girls from the towns and cities help in the harvest.*

F. M. SCHRADER

Meat and Wool

by

J. G. TAGGART and F. M. SCHRADER

Chairman, Agricultural Prices Support Board, Dom. Dept. of Agriculture, Ottawa, and Agricultural Economist, Economics Division, Dominion Dept. of Agriculture, Ottawa, (on loan to the Meat Board), respectively.

J. G. TAGGART

FARMERS received 578 million dollars from the sale of meat animals and wool in 1945. This represents 35% of the total cash income received from the sale of farm products. Meat and wool animals are raised in every region of Canada and on nearly every farm. These two facts emphasize the importance of live stock to agriculture.

Since this is intended to be a contribution to the general theme of Canadian agricultural resources it seems desirable to first present a brief factual statement of live stock numbers, regional distributions and changes which have taken place in the past twenty-five years.

By 1945 cattle numbers had reached an all-time peak. The number of sheep and lambs in 1945 had been surpassed only in 1944 and 1931 when the population was 3,725,500 head and 3,627,100 head respectively. In 1945 the hog population was 6,025,600 and had been greater in only the three previous years when the numbers of hogs on farms were over the 7 million mark.

The long-time trend of the live stock population is one of progressive increase. From 1920 to 1945 the cattle population increased 32%, the sheep population increased 14% and the hog population increased 91%. However, the number of horses declined by 24%. This last mentioned class of live stock is used as an instrument of production in Canada rather than for meat production. Because of this factor as well as its declining importance in Canadian agriculture, horses will not be considered further.

In general, since 1920, the live stock population has increased very little or has decreased in the five eastern Provinces but has shown large increases in the four western Provinces. This change in distribution of live stock population may be attributed, to a large extent, to the development and expansion of agriculture in western Canada. Cattle numbers increased 46% in Alberta and 112% in British Columbia with Manitoba and Saskatchewan ranging between these extremes of increase. In the Maritime Provinces there were fewer cattle on farms in 1945 than in 1920. In Ontario there was an increase of only 10% and in Quebec an increase of 22%. The number of sheep on farms declined in each of the five eastern Provinces while increases of at least 100% occurred in each province of western Canada. Hog numbers increased in each province from 1920 to 1945. The amount of this increase ranged from 2.5% in New Brunswick to 35% in Ontario for eastern Canada and from 55% in British Columbia to 438% in Alberta for western Canada.

Increases in meat production accompanied this increase in the live stock population. In the period 1920-24 the average annual production of pork, beef, veal, mutton and lamb was 1,132 million pounds. In the immediate prewar period 1935-39 the total average annual production had increased 25%. In the succeeding 5 war years production rose to 2,162 million pounds or 190% of the 1920-24 period. It is of interest to note that in the last 10 years more than ¾ of the total meat production passed through Federally inspected plants.

Pork production showed the greatest increase and was up 142%. Beef production increased 50%. These two classes of meat represent 92% of the total meat production during the war years. In 1920 the production of wool was 14.9 million

Table 1*

LIVE STOCK: NUMBERS ON FARMS AT JUNE 1, 1945

Province	Milk Cows	Other Cattle	Total Cattle	Sheep and Lambs	Hogs	Horses
	(Number of Head)					
P. E. Island	47,000	58,900	105,900	60,000	60,500	26,500
Nova Scotia	109,400	117,300	226,700	160,200	58,700	35,300
New Brunswick	118,800	107,300	226,100	113,400	82,300	46,200
Quebec	1,103,700	907,900	2,011,600	649,300	843,700	314,100
Ontario	1,253,100	1,654,600	2,907,700	724,300	1,979,000	491,300
Manitoba	366,000	658,500	1,025,500	287,600	457,000	264,200
Saskatchewan	525,100	1,454,100	1,979,200	513,200	1,006,600	782,800
Alberta	376,400	1,483,800	1,860,200	974,900	1,469,300	564,200
British Columbia	98,700	318,000	416,700	138,900	68,500	60,200
CANADA	3,998,200	6,760,400	10,758,600	3,621,800	6,025,600	2,584,800

Source: Agricultural Branch, Dominion Bureau of Statistics.

*The term "Milk Cows" means all cows that are being milked, including many of beef breeding. A large part of the creamery butter made in Canada is derived from milk produced by beef type cows. Cast-off dairy cows and surplus young dairy stock make beef and veal, thus contributing a large tonnage to the total meat supply. Because so many cows are used for both beef and milk production, total cattle numbers are used in this article, in conjunction with numbers of hogs and sheep, as being indicative of meat production.

Table 2

LIVE STOCK: PERCENTAGE CHANGES IN NUMBERS ON FARMS, 1920–1945

PROVINCE	Milk Cows %	Other Cattle %	Total Cattle %	Sheep %	Hogs %	Horses %
P. E. Island	+ 16.6	− 18.3	− 5.8	− 42.9	+ 29.8	−18.5
Nova Scotia	− 20.1	− 34.8	− 28.5	− 39.4	+ 9.7	−42.0
New Brunswick	+ 2.6	− 15.1	− 6.7	− 49.8	+ 2.5	−33.2
Quebec	+ 35.4	+ 8.9	+ 22.0	− 22.3	+ 22.5	−13.3
Ontario	+ 17.0	+ 5.6	+ 10.2	− 27.6	+ 35.0	−28.7
Eastern Canada	+ 20.8	+ 2.4	+ 10.5	− 29.8	+ 29.5	−24.8
Manitoba	+100.9	+ 49.8	+ 64.7	+109.3	+133.6	−15.1
Saskatchewan	+ 77.2	+ 79.7	+ 79.0	+206.2	+231.8	−25.3
Alberta	+ 31.7	+ 50.7	+ 46.4	+152.0	+437.6	−26.8
British Columbia	+132.8	+106.6	+112.3	+152.1	+ 55.0	+ 0.3
Western Canada	+ 69.3	+ 64.0	+ 65.3	+156.3	+267.6	−23.7
Canada	+ 33.9	+ 30.8	+ 31.9	+13.9	+ 91.2	−24.1

A western Canadian grazing scene

pounds. By 1945 wool production rose to 19.6 million pounds or an increase of 32%.

Some authorities suggest that the keeping of live stock is, or should be, the main purpose of operating a farm and that most of the farm activities should be directed toward providing the nutrition and care which will make for maximum output of live stock and live stock products. Actually, the truth appears to be that farmers keep live stock mainly for economic reasons.

These reasons include not only the cash returns from animal products as against returns from direct sales of crops but also such important factors as soil conservation, fertility and crop rotation. Animal husbandry sometimes makes such important contributions toward solving technical and conservation problems that the farmer may accept lower net returns in cash in order to gain these advantages. Generally, however, net cash returns from live stock products must exceed those from crop sales, or live stock production will not be maintained.

Originally, animals were kept on farms mainly, or wholly, for the sustenance of the farm family, and for work. Even now these uses probably account for more than 20% of the hogs and cattle on Canadian farms, and for practically all of the horses. If, as seems probable, farm population continues to decline relative to the total population, then these uses of live stock will also decline relatively. However, they will continue to be important for a long time on many small farms.

The second important function of meat and wool producing animals is the conversion of otherwise unsaleable material to saleable products. A large part of the beef, lamb and wool production of Canada comes from this type of operation. Much of the land which cannot be cultivated economically is used to pasture beef cattle and sheep. Likewise, lands which, for climatic or other reasons, must produce mainly grass and hay are also used for the same purpose, although there is an increasing tendency for the hay and

grass lands in the humid regions to be used for the sustenance of dairy cattle.

Another important contribution to the feeding of beef cattle and sheep is made by straw, corn stocks and many other by-products from arable land crops. If these by-products were not used for live stock feeding they would be largely wasted because there is at present little or no commercial or industrial use for them. On the whole, it does not seem likely that meat and wool production based on conversion and utilization of by-products will greatly increase. More likely the trend will be in the opposite direction.

Another important function of meat producing animals is to furnish an alternative market for cereal grains. In a large part of the prairie region cereal production is practically synonymous with arable farming. That is, if the land is to be cultivated, and crops are to be grown, those crops must be cereals. This "must" is imposed by climate, often in spite of the personal inclinations of the farmer.

Fortunately for the farmers who are so situated that they must grow cereals, meat production offers an important, and frequently, a profitable alternative method of selling their grain. Commercial pork production is derived almost entirely from this source. Beef and lamb feeding also utilize substantial quantities of cereals, but, since these animals are grown mainly on grass and roughage, cereals make a much less important contribution to total production than in the case of pork.

In attempting to appraise the potentialities of this type of meat production, it is evident that one is not dealing wholly, or even mainly, with physical factors, such as soil and climate. If those factors governed, then it is apparent that meat production in Canada could be doubled or trebled simply by feeding a larger percentage of our cereal production to hogs. That such development is not likely to take place must be abundantly evident from the trend of hog production since the middle of 1944.

As a matter of fact, meat production, particularly pork, is governed by economic factors such as relative prices of grain and hogs, availability and cost of labour, the general level of farm income, income taxes, and many others. For these reasons it seems somewhat futile to attempt to indicate in any definite way potential maximum meat production in Canada.

In attempting to appraise potential meat production two factors which now

A herd of Herefords on grass

tend to limit production would seem to deserve even more attention than they have had heretofore. One is the possibility of increasing meat production from the same resources by better nutrition, better disease control, and a lower mortality. Undoubtedly at the present time much feed is wasted on animals of low efficiency and on animals which die before reaching marketable condition.

The other factor is that of increased application of mechanical power to do the necessary work associated with meat production. It seems like an incredible waste to use even what labour organizations would regard as poorly paid farm labour, to do work that could be done better by an electric motor, or a gas engine. Much of the labour traditionally associated with live stock keeping consists of many handlings by manpower of bulky low valued materials such as hay, straw, manure and water. Even the valuable product, milk, is worth only 1½ to 2½c per pound, values which will not justify much manual labour if the worker is to be paid more than his board. If mechanical power could be made to replace much of the hand labour now applied in animal husbandry there would likely be an important increase in meat production because of cheaper conversion of hay and cereals.

THE PLACE OF AGRICULTURE . . .

(Continued from page 283)

economic policies of the country. The foregoing general outline, however, will probably be sufficient to indicate the completeness with which agriculture is integrated with the general economic fabric. It may also indicate why our agricultural industry is so commonly referred to as being basic or fundamental. Finally, it should show why policies and programmes designed to affect the general well-being of agriculture should be looked upon as matters of universal concern.

Dairy Cattle

by

A. R. NESS

Professor of Animal Husbandry, Macdonald College, (McGill University), Quebec

Canada could be made an even greater breeding ground for dairy cattle. The pure bred industry is growing rapidly and the potentialities exist to develop and merchandise dairy seed stock of sound health and high quality.

THE dairy industry in Canada has grown and enhanced its value since the days of the introduction of the factory system, the cream separator, the Babcock tester and the improved cold storage facilities. Any attempt to deal with the subject of dairy cattle in relation to Canada's natural resources would not be complete without at least some reference to the dairy industry as a whole.

A. R. NESS

In the year 1871 there were one and one-quarter million milk cows in Canada and by 1910 the number had more than doubled. By 1944 the total number of milk cows in Canada reached 3,930,000. This trend hardly needs further comment but it is of much more than passing interest to note that there was roughly an increase of 1,000,000 cows during the First Great War as compared to 300,000 during the Second Great War.

There are, no doubt, a number of factors responsible for the rise and, on occasions, decline but nevertheless continual upward trend in the number of milking cows in Canada. Amongst these factors the prices of dairy products appears to be a dominating one, while during the latter period the cost and shortage of labour was a critical factor. The following quotation of prices is taken from the 1945 volume of the *Canada Year Book*.

Prices of Dairy Products. "Butter prices at the factory, which had averaged approximately 23 and 25 cents a lb. in 1939 and 1940, advanced to nearly 33 cents in 1941 and 34 cents in 1944. The former prices were comparable with those paid during the early stages of the War of 1914-18, but were considerably lower than those paid in 1919 and 1920 when the average was 54 and 57 cents, respectively. Factory cheese prices moved up from 12 and 14 cents in 1939 and 1940 to nearly 21 cents in 1944; whereas in 1916 and 1917, cheese prices averaged 18 and 21 cents, respectively. In 1920, however, the prices advanced to 26 cents. Sales income figures have shown a steady increase since the beginning of the War. In 1944, the average was $1.87 per hundred lb. of milk as compared with $1.27 in 1939. These were lower than those of 1920, however, the average for that year being $2.17."

The preceding quotation depicts in no small measure the dominant position of price of product in contrasting the smaller increase of milk cows during the past five years as compared to the period 1915 to 1920. The total value of all dairy products practically doubled in each ten year period up to 1920 when it was quoted as $204,400,000. In 1944 when over 17.5 billion pounds of milk were produced, the highest on record, the total value of all dairy products was $391,289,000., also the highest value on record for Canada. During the five-year period ending in 1944 the production of milk increased 1.8 million pounds and the industry as a whole made a great contribution to our food resources.

What the future holds in store for the dairy industry is not easy to foretell. There are evidences now that production has fallen, particularly in the western part of the country. The public has been schooled to the advantage of milk in the diet and whether or not it is because of this knowledge or the low cost to the consumer, because of subsidies, certainly the consumption of milk in its fluid state is increasing and is higher today than ever before. Milk and butter are short in supply. Our commitments to Great Britain and UNRRA and our domestic requirements have not materially changed so that if our economic structure does not greatly alter, we are likely to

proceed as we did following the First Great War.

These facts have been presented, not necessarily to proclaim the patriotism of Canada's dairy farmers during the periods of the two wars, admirable as it was, but to point out possibilities and to illustrate an economic fact which must not be overlooked in further developing Canada's abundant natural resources through the dairy cow.

The dairy cow provides an efficient medium through which to market farm grown crops for the purpose of providing human food. The following statements are found in almost every text book and bulletin in support of such a claim: that dairy farming is the most intensive system of live stock farming and therefore most adapted to the more expensive land; that of all of our farm animals, the dairy cow provides more edible human food for each 100 pounds of digestible matter consumed; that milk and dairy products are assuming more and more importance as articles of food in the human diet. One might make mention also of the priority accorded the dairy cow in Britain under the stress and strain of food and feed shortage during the war. It is to be hoped that Canada's economic position, however, will never reach such a critical state. It must be admitted that the requirement for milk and dairy products is not likely to reach our potential possibilities of production in this country and, together with labour problems, might conceivably render some of these assets of the dairy cow somewhat of a liability. Feed represents a large part in the cost of producing dairy products and in this respect eastern Canada with her possibilities of hay and pasture and western Canada with her possibilities in cereals, places the natural resources of the country in a position that would be difficult to excel.

In order to protect and possibly increase the fertility of the top few inches of our crop producing soil, extensive programs are in force in at least most of the Provinces of the Dominion to encourage the use of commercial fertilizer, improved

pasture and hay lands and the greater use of legumes. When the dairy cow is fed at near optimum standards she too lends considerable support to this aspect of one of our important natural resource problems. The return to the soil of farm yard manure from any class of live stock is an economic source of fertility. The dairy cow finds herself in a somewhat unique position in that there is actually very little fertility value removed when milk is the product sold from the farm. The dairy farmer is often a buyer of fertility through the purchase of a portion of his basic feed and certainly this is true when he purchases high protein feeds.

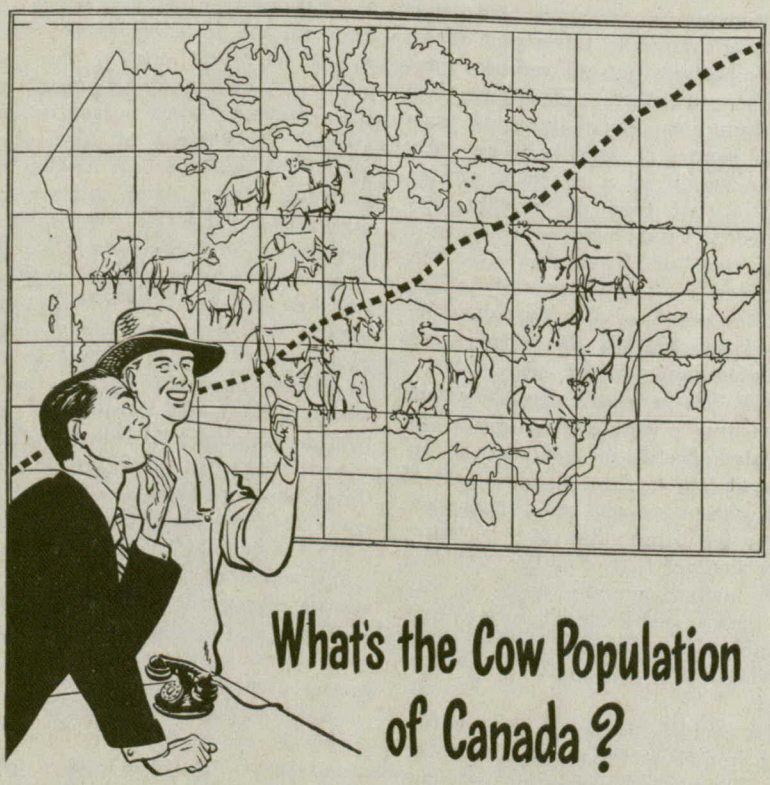
Probably few persons realize the extent to which this principle operates or the accumulated effect in the soil over a period of years. On the basis of their content of nitrogen, phosphoric acid and potash, each feed has a fertilizing value. It is of course not to be assumed that of all the fertilizing value in manure actually finds its way back to the cropped fields. There is at best considerable loss through leaching and more when the manure is not well managed.

Canada could be made an even greater breeding ground for dairy cattle than the position she now holds whether for home use or export. The men of character and ability who have built up the breeding herds of the country together with those in executive positions who have assisted materially in initiating and developing the various agencies with which to effect improvement in dairy cattle, stand out as an important cog in the country's natural resources. In co-operation with the different breed organizations the Federal Department of Agriculture has played no small part in making possible Canada's present dairy cattle assets. An organization similar to our Canadian National Live Stock Records is found in no other country. The record of performance has been the main stay of the pure bred breeder and with some minor changes in prospect will no doubt continue to play an equally important part in the future. The work of the Health of Animals Branch has placed Canadian live stock in a particularly enviable position and in this connection special mention should be made of the results of the elimination and control of bovine tuberculosis in Canada.

In the field of live stock, vigilance must ever be the watch word and in spite of successes attained in the past there will be problems to be met and need for even greater progress in the future.

Canada's pure bred dairy cattle industry is growing rapidly. The annual registrations in 1910 totalled approximately 8 thousand head including all breeds and in 1943, the record year to date, there were registered over 86

● *Holstein Friesian cattle on pasture. They are the leading dairy breed in Canada.*



What's the Cow Population of Canada?

There are nearly 4,000,000 dairy cows on Canadian farms.

This amazing total is actually one cow for every three people and it indicates how vast is the production of Canadian milk and cream.

When you consider that there are 4,500 plants where milk and cream are handled or processed you begin to understand how important to Canada is her dairy industry.

This industry takes the output from 500,000 dairy farms and produces hundreds and hundreds of by-products besides butter, cheese, ice cream and milk concentrates. It does a yearly business of over $400,000,000 and employs, directly or indirectly, over 17% of Canada's population.

Dairy products and concentrates are playing a vital part in the relief and rehabilitation of a hungry Europe.

We, of the Borden Company, are doing everything we can to help. We are continuing to carry out this responsibility and also to supply our Canadian customers, thanks to the loyal assistance and co-operation of 3,137 Borden employees.

THE BORDEN COMPANY LIMITED
TORONTO, CANADA

thousand head. The annual transfers, which indicate the volume of trade, are usually a few thousand below the annual registrations. The prices paid for breeding stock by private treaty and by public auction have been well publicized and in view of the limited space available, they will not be reviewed.

It does seem, in order to take full advantage of the growing industry, that quality breeding stock must be the aim. We are moving steadily in that direction as the number of pure bred cows placed on and qualified in the R.O.P. has more than doubled in the past ten years. The number of cows qualifying each year, hardly one-third, is definitely too low. Nevertheless this negative information is required so that each individual breeder can formulate a fundamentally sound breeding policy. When we consider that approximately 20% of the dairy stock of the country is turned over each year and one-third of these are discarded because of low production, it surely points to the possible returns from a more intensive program, followed by rigorous selection, in order to purify, at least for production, our seed stock. In the hands of our topmost breeders with their comparatively large herds of breeding cows and through the additional use of artificial insemination, highly qualified breeding sires by themselves and through their sons can, in a comparatively brief period, play an important role in reducing the number of replacements raised and removed from our herds because of low production.

Canada has the potentialities to develop and merchandise dairy seed stock of sound health and high quality. The opportunity of exporting breeding stock is actually great. At present we are tasting some of the fruits of such an endeavour and there is every possibility for it to become a significant feature of our national wealth.

The Ayrshire is a popular breed in Canada, while Jerseys and Guernseys find favour with many producers.

Agricultural Resources of

British Columbia

● Excellent results have been achieved in the production of such specialized crops as tree-fruits, berries, bulbs, vegetables, tobacco, fibre flax, certified seed potatoes, and high quality vegetable seeds. There are the usual general farming possibilities as well and an extensive home market exists for meats, eggs, and dairy products.

● That present holdings may be increased in size when necessary a land-clearing policy has been adopted, heavy machinery purchased and a policy has been laid down for the guidance of the Land-clearing Branch of the Department.

● A complete Extension Service with agricultural representatives located at strategic points throughout the Province and specialists in the various production fields is available.

● Four-fifths of British Columbia's agricultural land is unoccupied leaving room for expansion. With its favorable climate, cheap available electrical energy and proximity to the Pacific with its tremendous potential market this front-door province of the Dominion is in an advantageous position as regards further developments along global lines.

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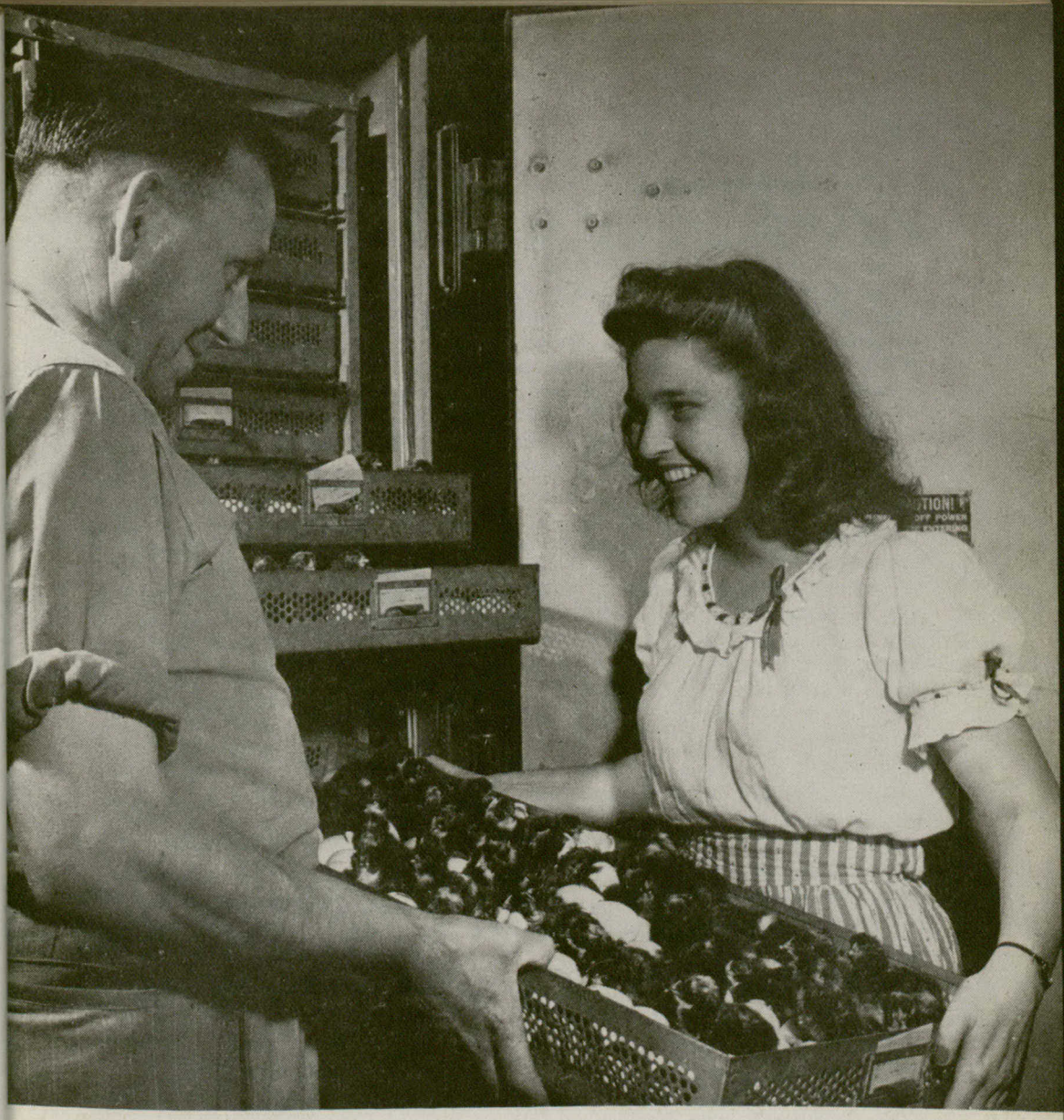

Poultry and Egg Production

by J. R. CAVERS

Professor of Poultry Husbandry, University of Manitoba, Winnipeg

POULTRY serve as a national resource through their ability to convert grains and concentrate feeds into highly nutritious human food. Eggs and poultry represent between 6 and 7% of the gross value of Canada's agricultural production. The poultry industry continues to supply an expanded and unrationed home market, while making an important contribution to Canadian food commitments abroad. Since raw materials for its production are readily grown and processed in Canada, the industry's inherent capacity is seemingly unlimited. But potential production infers also the possibility of accomplishment, wherein arise two limiting factors—markets, and the suitability as to cost, quality and seasonal supply of Canadian eggs and poultry for those markets.

Farm Production

Poultry keeping is Canada's most widespread live stock enterprise. It is typically a mixed-farming enterprise, with thousands of relatively small flocks and comparatively few farms on which it provides the major source of income. Farm eggs and poultry are to be valued as more than a percentage of income; they are a mainstay of the household. Eggs count heavily as a protective food in the farm family diet. Along with cream cheques, the revenue from poultry products helps to maintain a steady flow of household necessities. Invaluable in periods of drouth and crop failure, these lesser income sources bolster considerably the standard of farm living.

Will the poultry producers make the necessary improvements in efficiency of production to hold and build up the export market? If not, then producers will be faced with the prospect of reverting to a market closer to prewar size. This is a challenge the poultry industry must recognize and plan to meet. There are possibilities for further development.

J. R. CAVERS

Farms on which grain is grown can supply 90% of their poultry feed requirements. A common practice is to purchase a prepared feed for young chicks, followed by concentrate materials to balance with home grown grains for growing, fattening and laying stock. Under such conditions, with normally ample grain supplies and a well-organized trade in supplementary requirements, Canadian farmers should be in an enviable position with respect to production costs.

However, a full granary does not necessarily ensure efficiency in poultry production; it may lead to indifferent methods of housing, feeding and marketing. When feed grain is come by easily, there is a tendency to overlook the cost of the resulting product. Grains inadequately supplemented with protein, vitamin and mineral nutrients, make for largely maintenance feeding and costly production. One result is a markedly seasonal flow of eggs—scarcity during the autumn months and a tremendous production in the spring season when nature may balance the hen's diet outdoors if her owner has failed to do this for her indoors. The calendar months of winter balance with those of summer, indicating that laying hens find Canadian winters no great handicap. The ratio between fall and spring eggs, generally speaking, is narrower in provinces where farmers are obliged to buy much of their feed grain; this is revealed in the accompanying table showing deliveries of eggs to grading stations in the various provinces.

The data presented here are from estimates issued weekly by the Dominion Department of Agriculture. These figures do not give a true picture of production since less than half of Canada's estimated annual egg crop is sold through the registered stations. Moreover, in some provinces, a number of stations are closed entirely for a few weeks during the season of short supply. However, we have no better indication of the production curve; and, what is more important, all eggs for export come from the registered grading stations.

Egg Exports to Date

Spring is the natural laying season for all poultry in the northern hemisphere. Likewise, with respect to export eggs, Canada's main outlets are located in the northern hemisphere. With receipts running three times heavier in the spring peak than during the autumn period of low production, we have practically no surplus eggs beyond domestic needs from July until late December—the period when the importing countries are short as well. If we do have fresh eggs to export in the fall, as was the case in 1944, it can only mean a huge surplus the following spring. As a matter of fact, eggs set aside during the first six months of 1945 for export purposes, amounted to nearly 25% of the entire year's production. Some were sent directly overseas as fresh shell eggs, others were oiled and

RECEIPTS AT REGISTERED EGG GRADING STATIONS, SHOWING SEASONAL VARIATION, BY PROVINCES.

Province	Receipts, Low Period, 1944		Receipts, Peak Period, 1945		Ratio of High: Low
	4 weeks starting	30 doz. cases No.	4 weeks starting	30 doz. cases No.	
British Columbia	Oct. 15	43,360	Apr. 1	63,723	1.5:1
Ontario	Oct. 8	115,913	Apr. 1	327,974	2.8:1
Quebec	Aug. 13	17,995	Apr. 1	64,741	3.6:1
Nova Scotia	Aug. 6	2,659	Apr. 8	10,189	3.8:1
Alberta	Oct. 29	20,790	Apr. 22	117,259	5.6:1
Manitoba	Oct. 15	11,539	Apr. 1	80,749	7.0:1
New Brunswick	Oct. 22	752	Apr. 1	6,442	8.6:1
Prince Edward Island	Nov. 5	1,802	Apr. 22	16,458	9.1:1
Saskatchewan	Nov. 12	6,606	May 13	116,108	17.6:1
CANADA	Oct. 15	230,903	Apr. 1	792,052	3.4:1

stored for shell shipment in the fall, still others went in the form of egg powder. Canada's surplus eggs find ready demand abroad again this year, and the same may hold true for several seasons to come.

Regarding the long term future, the export trade in eggs is likely to be of quite a different pattern, compared with the past or present. Between the two great wars Canada exported between 1 and 2% of each year's egg production. The eggs were purchased at rock bottom prices in the spring, being placed in cold storage and shipped chiefly to Great Britain during the autumn. These eggs came largely, if not entirely, from the Prairie Provinces, but they contributed a small measure of relief to the entire industry with its countrywide springtime glut of eggs.

Exports from 1930 to 1941 helped merely to sustain Canada's poultry industry rather than to develop it. Each year saw Christmas week with a few surplus eggs and the bottom falling out of the market—only in areas lacking in grain and poultry did winter egg prices hold up. Yet exporters found it necessary to wait until about April for prices low enough for their purpose—they had first to store the eggs until autumn and then to compete on the British market with countries much closer to it, countries, moreover, enjoying special ocean freight rates on feed grain from Canada. Under the circumstances, little progress could be made by any branch of the industry. Producers became disheartened with low winter and spring egg prices, farm flocks were either liquidated or neglected, and late summer found few eggs coming to market. Specialized producers stayed in business by capitalizing on the relatively high autumn prices that inevitably followed. Despite the excellent facilities that were developed, Canada could scarcely hope to establish herself in markets abroad with cold storage eggs.

The year 1942 brought a great change in the situation. The Special Products Board, buying in quantity for export all eggs offered at their quotations, in effect provided a floor for all Canadian eggs. The price curve was a straight line from January to June, the period of surplus production. The average value of all eggs produced was 29c per dozen, compared with 21.3c the previous year and 18.5c in 1939. Since 1942, values have advanced a further 2 to 3 cents per dozen. Incentive prices have resulted in more laying hens and more eggs per hen, thus enabling

Canada to keep pace with the 20% increase in domestic consumption while increasing her exports a hundred-fold.

Poultry Meats

Eggs cannot be produced without poultry meat. The latter was classed as a luxury and banned from shipment overseas in the fall of 1939. Previously Canada had exported from 2 to 3% of her chicken and fowl crop and up to 7% of a season's turkeys. Again these came from the Prairie Provinces, but served to strengthen the poultry market right across Canada. After the first year of war, as the demand for all meats increased, dressed poultry found ready sale on the home market. What might have proved an embarrassing situation in 1944, was eased by way of the United States army to the extent of 30 million pounds. Present rationing of other meats places poultry in keen demand.

Trends of the future can scarcely be predicted in view of the unnatural situation surrounding poultry meats since 1939. Previously the picture was, if anything, brighter than for eggs. Great care was taken in the selection of carcasses for overseas shipment. Indeed there is a general feeling that the same attention to quality, applied on our Canadian markets, might serve to maintain the per capita consumption of poultry meats at somewhere near the present high level. Revised methods of merchandising dressed poultry are long overdue in Canada, though they will merely supplement, rather than substitute for, high quality of product.

Future Requirements

To what extent may the poultry industry develop as one of Canada's agricultural resources? We have indicated its role in converting raw materials into products of much greater value. In that respect poultry flocks are an important factor in the marketing of Canadian grain. Yet we have seen that the years of cheap grain, during the thirties, failed to establish the poultry industry on a sound and business-like basis. Present production is considerably beyond prospective domestic requirements, even though these may be held above prewar levels through improved quality of products along with improved conditions of employment and greater spending power. It appears that any further development must depend upon outside markets.

Great Britain has shown an interest in supplies of fresh eggs in the fall. Obviously, as we have seen, Canada must continue to have an outlet for a large surplus of spring eggs, or else reverse the production curve, in order to take advantage of such an opportunity. Specialized producers in every province of Canada are able to get satisfactory year-round egg production. But farm flocks still tend to lay in a highly seasonal fashion, despite the improved feeding and care that has resulted

from the more encouraging prices for their products in recent years.

There is one hopeful trend so far as these flocks are concerned, namely, a tendency towards semi-commercial farm flocks. Whereas a small flock may or may not receive the best of feed and attention, no one can afford to keep a flock of several hundred hens without thought for efficiency. The Kansas slogan of "30 or 300 hens per farm" applies here. Persons with little interest in poultry are advised to keep only a family-sized flock, leaving no surplus eggs or poultry for market. The flock of 300 must be given proper care if the project is to continue.

Early hatched chicks, artificially brooded and properly fed, so as to make good fall layers; enough hens to warrant proper housing, feeding and management; enough eggs to warrant frequent gathering, prompt chilling, and regular marketing—these factors that make for efficiency in egg production, may be applied with any size of flock, although a larger unit makes dodging of the issue less likely. The situation is not necessarily the same regarding market poultry; indeed its quality may tend to deteriorate for awhile as flocks become larger.

Finally, one may state that the Canadian poultry industry has two alternatives —either it must eventually leave the export market and revert back to something approaching prewar size, or it must markedly step up its efficiency in all branches, including the consumer appeal as to price and quality of its products, in order to maintain not only a maximum home market but also its share of a world market for poultry and eggs. This is primarily a challenge to the poultry extension workers in all government and college departments, and in industry, as well as to the experimental workers back of them; it is a challenge to Canadian poultry producers from coast to coast. Some may aver that there is still a third alternative, that of subsidized production or subsidized exports. Be that as it may, the poultry industry would then have to compete with other agricultural lines for favour in the high places of government. Poultry and egg production is one of Canada's agricultural resources that has wide possibilities for further development.

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Cattle	570,000 head
Calves	292,000 head
Hogs	1,900,000 head
Sheep and Lambs	268,000 head
Poultry	96,948,000 lbs.
Eggs	111,567,000 dozen
Butter	80,367,000 lbs.
Cheese	115,105,000 lbs.
Fluid Milk	1,557,025,000 lbs.
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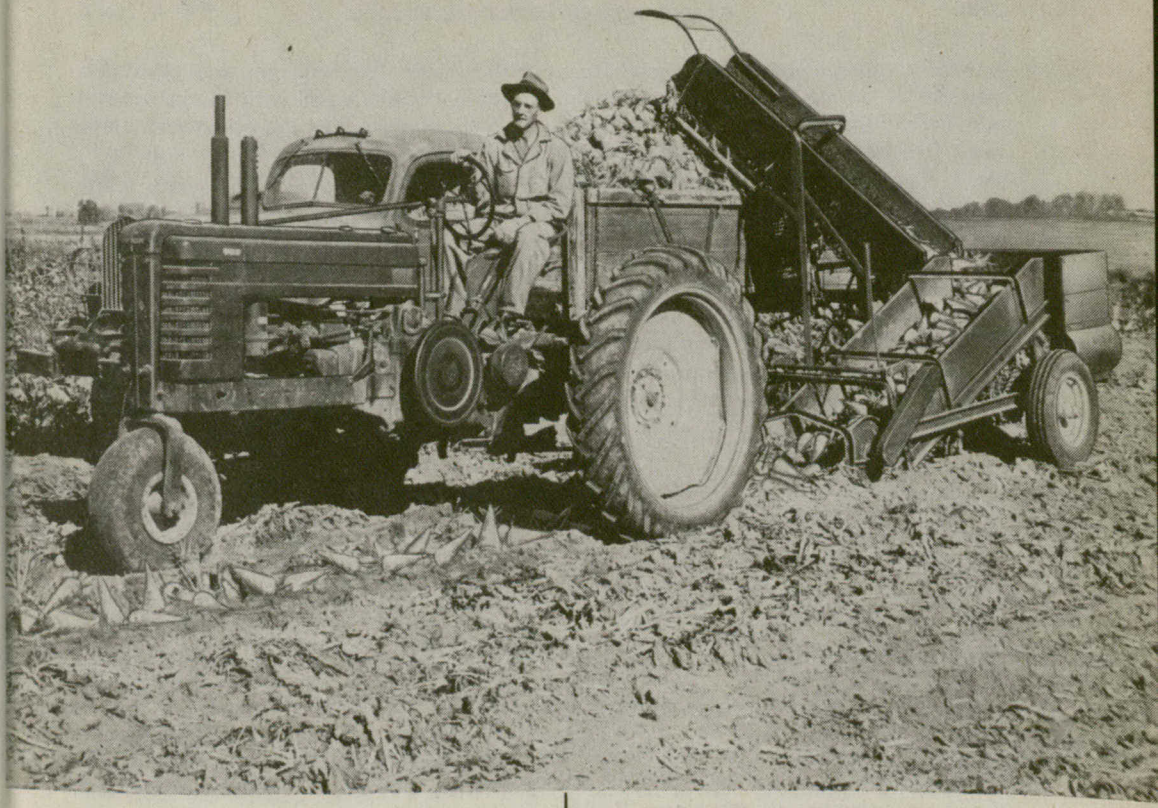

● *One of the modern machines used for harvesting the sugar beet crop.*

Special Crops

by J. COKE

Senior Economist, Agricultural Economics Division, Dominion Dept. of Agriculture, Ottawa

MANY people think of Canadian crop production in terms of wheat, oats and barley. There are, however, a number of crops which occupy smaller areas but contribute substantially to cash farm income in those areas in which they are grown. These include tobacco, sugar beets, hybrid corn, soybeans, sunflowers, rape seed, honey and maple products.

J. COKE

Tobacco

This crop is grown mainly in southwestern Ontario. Actually there are several types and these are grown in districts where conditions are suitable for their production. Thus very little flue-cured tobacco is now grown in Essex and Kent Counties. It is mainly produced in Norfolk, Brant, Oxford, Elgin and Middlesex Counties with a small acreage in Durham County. In Quebec this type is grown in Joliette, Montcalm and Berthier Counties. Smaller acreages are also grown in the Fraser Valley in British Columbia. Burley tobacco is pretty well confined to Essex and Kent Counties in Ontario and production of the dark type is also limited to these Counties. Cigar tobacco and pipe tobaccos are produced in the County of Rouville, east of Montreal. Thus tobacco is not just "one crop". The different types

vary in requirements of soil, temperature, method of curing, utilization and yields per acre. Most varieties need 120 days frost free but some reach maturity in 75 days. The air cured types are generally grown on heavier soils than the flue-cured types.

In 1945 approximately 93,600 acres of tobacco were grown in Canada, of this 77,200 acres were flue-cured and a little more than 10,000 acres Burley tobacco.

The expansion in tobacco production in Canada has been in the flue-cured type. In 1927, for example, 8,000 acres of this type were grown. Over the period 1935-39 the average acreage was 50,700. The recommendation for 1946 is 85,000 acres.

The acreage in Burley tobacco has fluctuated considerably. There were 20,500 acres in 1927 but production had been declining prior to the outbreak of war. The average in the 1935-39 period was 8,600 acres. Small increases took place in the war period and 10,185 acres were reported in 1945. The present stock position would indicate that an increased acreage might be grown in 1946, and the recommendation is 12,500 acres. Burley tobacco has encountered stiff competition from hybrid corn, canning crops, white beans and to a lesser extent, soybeans.

The production of cigar tobacco has likewise suffered from the competition of other crops. The pipe tobaccos yield less than other kinds and with the increase in the use of cigarettes, the demand for these types has declined.

It may be noted that, in recent years, Canadian manufacturers have been almost wholly supplied from Canadian tobacco. This was in part due to wartime controls but also was due to improvement in the quality of Canadian leaf. This improvement may be traced to better methods of planting, standard fertilizer formulae for tobacco, the introduction of priming and improved methods of curing.

Sugar Beets

Sugar beets are grown in fairly well defined areas in four provinces. At the same time it may be said that favourable conditions for production of this crop exist in large sections of the country. High labour requirements and competition from intensive crops restrict the area of the sugar beet crop.

In Ontario beets are grown in Essex, Kent, Elgin, Middlesex and Lambton Counties. The production from this area was at one time the sole Canadian supply of beet sugar. Factories are located at Chatham and Wallaceburg. In recent years, however, the largest area in beets has been grown on irrigated land in Southern Alberta. Commencing in 1940,

A tobacco field in south-western Ontario

Manitoba farmers began producing this crop for processing in a new factory at Fort Garry. Later another new factory was built at St. Hilaire in Quebec and operation commenced in 1944.

The peak in acreage occurred in 1940 when 77,548 acres were harvested. This acreage was distributed as follows: Ontario, 40,100; Alberta, 24,000 acres and Manitoba, 18,100. In 1945, out of a total of 60,000 acres, Ontario grew 17,700, Alberta 30,300, Manitoba 10,000 and Quebec 2,000. It might be said that in 1943, the area in sugar beets in Ontario fell to 9,300, the lowest in many years. This was probably due to competition from other crops and labour shortage.

During recent years and chiefly since the outbreak of war, great progress has been made in mechanizing the production of beets. In earlier years, contract labour was employed on a large scale. With the shortage of labour in wartime, this problem was met in part by the utilization of prisoners of war but it had to be dealt with on a more permanent basis. Thus planters have been improved so that a more even stand may be secured. Thinning and blocking machines have been developed. Harvesting and topping and loading machines have been introduced on many farms. The supply of these machines is still small and some imperfections are still to be overcome but the back-breaking work in handling beets on the farm is on its way out. At the factory end, mechanical unloading and handling has been successfully applied.

Other wartime developments include the introduction of segmented and pelleted seeds. The segmentation process is designed to leave only one seed per segment. This practice has been largely adopted. For example, in Ontario it is anticipated that 90% of the acreage to be planted in 1946 will be sown with segmented seed.

The pelleting process is a more recent development. It is designed to overcome the rough edges of the seed and to enable an even flow of seeds through the planter. A similar effect is secured through polishing. Experience thus far indicates that though some difficulties are being encountered in germination of pelleted seed, these will be overcome.

The total output of beet sugar in Canada in recent years has varied from 129,268,010 pounds in 1943 to 215,879,271 pounds in 1941. The value of the refined sugar output at the factory was about $6,000,000 in 1938 and $11,600,000 in 1941. Beet sugar has represented from 13.7% of the total sugar refined in Canada in 1938 to 23.6% in 1942. The average for the seven year period 1938-1944 was 17.0%.

Hybrid Corn

One of the most significant developments in recent years has been hybrid corn. The development of hybrid strains has resulted in a more dense root system capable of providing greater food supply and holding the plant in position more securely. It resulted in stouter stalks and thus lodging is less frequent. This in turn makes harvesting much easier. The crop matures more uniformly. The sturdy stalks make hybrids less subject to serious breakdown in corn borer infested areas. In addition to this the yields from hybrid strains are considerably higher than those of standard varieties. In Ontario some hybrids have out-yielded standard varieties by as much as 30% and others by 15 to 25%. The influence of hybrid corn may be emphasized by the re-expansion in production of corn in Ontario. In the period 1936-1940, the average area in corn for husking in Ontario was 175,859 acres. In the period 1941-1945, it was 232,080. Of course, varying prices and weather conditions affect crops from year to year but in these same periods, production was 6,843,273 bushels and 10,634,400 respectively. The yield per acre in the 1941-1945 period was 17.7% more than in the 1936-1940 period.

Another test of the effectiveness of the hybrid strains is found in the shift from standard varieties to hybrids. In 1938 there were no hybrid strains planted in Ontario but by 1941 from 50 to 60% of the acreage was hybrid corn and by 1944 it was 95%.

Another point may be suggested. For many years manufacturers of starch were not disposed to purchase Ontario corn readily. The introduction of hybrid strains has largely overcome their objections.

Sunflowers

Sunflowers gained new importance during the war when they were grown and processed to provide edible oil. This development was made possible through the efforts of plant breeders at the Dominion Forage Crops Laboratory, Saskatoon, Saskatchewan. Prior to 1940, not a sunflower was grown for the edible vegetable oil it could supply. For 1946 an area of 28,000 acres is suggested as desirable. The yield is about 800 pounds per acre which could mean 22,400,000 pounds of seed this year.

The Mennonite variety was brought to Canada from Russia about 70 years ago. From this variety a strain called "Sunrise" was developed and more recently a new hybrid has been produced which is called "Advance". This new sunflower produces about 30% more than Mennonite or Sunrise and does not shatter readily. The kernels are plump and the weight per bushel higher than that of other varieties. The sturdy stock prevents lodging and since it is of a more uniform height, it may be harvested by combine more readily than other kinds. This is an important factor in keeping costs at a lower level.

In 1944 sunflower oil consumed in Canada amounted to 17.3 million pounds. Of this amount 13.1 million pounds were used as vegetable shortening and the balance as salad oils and in mayonnaise. It is believed that we could use up to 50 million pounds providing it could be made available at a competitive price.

Sunflower oil is a really fine oil. During the war it replaced olive oil quite largely. It also is used as a shortening. Moreover, after the oil has been extracted, the meal may be used as a livestock feed. It contains up to 47% protein. Besides this, the hulls contain furfural which may be used in the manufacture of resin, plastics and in purifying motor oils and materials used in the production of synthetic rubber.

The production of this crop at present is especially important because of the shortage of lard. This may be emphasized when it is considered that output of lard has fallen from 120 million pounds in 1944 to 57 millions in 1945 and may drop further to 45 million pounds in 1946.

Soybeans

In the last ten years soybean acreage has more than trebled. In fact in 1944 it was almost four times larger than in 1936. This was the high point in production when 925,000 bushels were grown on 44,000 acres. In addition to the crop grown for processing and for stock feed, between 7,000 and 9,000 acres were grown for forage. Over the period 1936 to 1944 the yield per acre varied from 16.0 to 22.0 bushels.

The crop is grown in every province but 95% of the acreage is in Ontario. About half of this acreage is in Essex, Kent, Elgin, Lambton and Middlesex Counties. The soybean thrives in a long growing season with relatively high temperatures. It requires a fair amount of rainfall and prefers a clay loam or sandy loam soil.

Soybeans are used commercially to obtain oil. The residue is a high grade stock food or may be used as flour. Most of this product is marketed in eastern Canada. The oil is used as a vegetable shortening, as a salad oil, and in foods. Soybean oil is also used in the paint industry in light coloured lacquers and coatings of buildings and railway equipment.

The utilization of this oil in Canada in 1944 totalled 13.5 million pounds of which 12.8 million was used in foods, 200,000 in the paint industry, 226,000 in soaps and 50,000 pounds in the textile industry. It is anticipated that still more will be used in the paint industry. The building program should ensure this. In addition larger amounts may be utilized in the food industry.

Estimated production of soybean meal in 1944 was 9,358 tons. In addition, 16,634 pounds were imported. In other words, consumption was nearly 26,000 tons. In 1945 Canadian production was estimated to be 15,000 tons. Canadian processing plants are expected to crush about 1,750,000 bushels in 1946 of which approximately 350,000 will be grown in Canada.

Rape Seed

Rape seed oil is another wartime product in so far as Canada is concerned. This crop may be grown in many places in this country. However, commercial pro-

Here is an old practice—and one having merit for certain areas

duction is largely confined to Saskatchewan and Manitoba. The crop requires from 85 to 100 days to mature. It is easily harvested with a swather and combine. Some farmers simply combine the crop. Others use a binder and stook it. The yield per acre varies from 400 to 2,000 pounds per acre.

Rape seed oil was not produced in Canada prior to 1943. But in 1944 2,200,000 pounds of oil were used in this country. This oil is used as a marine engine lubricant but its popularity as an edible oil has grown rapidly. Thus of the 2,200,000 pounds used in 1944, 1,300,000 were used for marine oil lubrication and 900,000 were used in food stuffs. It is estimated that 1,200,000 pounds could be used in food stuffs this year.

Honey

Unlike many of the crops discussed in this article, honey is produced in every province. Over the period 1940-1944, Canadian production averaged 32,789,400 pounds. More than half of this amount came from Ontario and Quebec. In spite of this, it should be noted that production has been rising more or less steadily in the Prairie Provinces. The biggest crop yet produced was harvested in 1938 when 45,708,000 pounds were produced.

Adequate moisture, sunshine and warmth are necessary to the production of honey. The bees must be able to work. In some measure, this may explain why honey production is low in coastal provinces. Alsike and red clover are two important crops from which nectar is obtained. They grow in British Columbia and the Maritimes but climatic conditions are not conducive to large acreages of clovers and, therefore, there is less concentration in honey production than in the central provinces.

On the prairies, sweet clover and alfalfa are the main sources of nectar, particularly in the more northerly districts. These along with adequate sunshine materially aided in the increase in production.

One of the problems in honey production is satisfactory wintering of bees. Losses have been high, particularly in the

prairies. Some beekeepers feel that it is cheaper to destroy their bees in the fall and replace them in the spring with package bees from the United States. At the same time methods have been developed to winter bees satisfactorily.

In earlier days, fruit growing and beekeeping were complementary enterprises but the increased use of poison sprays have made beekeeping unprofitable in orchard areas.

Methods of selling honey have changed over the past 20 years. Considerable quantities are sold direct to consumers, but a good deal of processed honey is on the market. This new technique is a form of pasteurization in which yeasts are destroyed and fermentation prevented. Honey is heated to 160°F, cooled quickly, "reseeded" with a sterile fine grain honey and stored at a low temperature until regranulation has taken place. About 8,000,000 pounds are produced at present in central packing plants. Potential production is much higher but honey is in great demand and less of it is processed than will be the case in more normal times. The development of central packing has enabled better storage and more even distribution of the product over the year. Consumption per capita is about three pounds per year which seems to indicate that domestic usage could be increased.

Exports of honey did not become a problem or a possibility until the prairie production reached substantial quantities. Approximately 50,000 pounds were exported in 1924 to the United Kingdom. From these beginnings exports in 1939-1940 amounted to 10,000,000 pounds. The United Kingdom market was closed in 1942 but short crops and high domestic demand have made disposal of the crop quite simple, although there are prospects of a resumption of export trade at an early date.

A recommendation for 43,000,000 pounds production in 1946 was made at the Dominion-Provincial Conference in December. There are now more than 500,000 colonies of bees in Canada and with ideal conditions for production, potential output is estimated at about 59 million pounds.

Maple Products

Sap's running! Spring is here! Over long years, the maple syrup season has ushered in activities in the new crop year. As early as 1861, it was reported that 16 million pounds of maple sugar or its equivalent in syrup were produced in Canada. Census records reveal a continual rise until 1890 when the output was placed at 25 million pounds. Then followed a decline which is attributed by some to reduced consumption arising from the extensive adulteration of sugar and syrup. At any rate only 17,800,825 pounds were reported in 1901. Legislation was introduced to regulate the quality of maple products in 1915. Then in 1945 maple products were placed under the Maple Products Industry Act. Enforcement of this legislation has resulted in a generally improved quality of these products. In the period 1940-1944, production averaged 27 million pounds. One estimate made places potential production at 80 million pounds.

In 1941, 39,267 farmers engaged in making maple syrup. Of this number, 25,350 were located in Quebec; 12,906 in

Ontario and the other 2,011 were distributed over the Maritime Provinces.

Methods of harvesting the maple crop have undergone great changes. In earlier days, the wooden spile and wooden bucket were used to secure the sap. These have given way to metal spiles and metal sap pails with covers to keep out rain and snow. The old iron kettle has been replaced by an "evaporator" which is set up in a "sugar camp".

The syrup is now tested by specific gravity instead of the 'drop' from a stick or dipper, or by tasting. No longer does the farmer carry the sap to the camp. It is collected in covered tanks drawn by horses. All of these changes have tended to improve the quality of Canadian maple syrup.

Different methods of selling are followed in different regions. In Ontario and the Maritimes, a good deal of the crop is sold direct to retailers. Some is sold on public markets and some is still sold direct to friends, relatives and "regular customers".

In Quebec, about one half the crop or about 40% of the total production is sold to manufacturers or packers. These dealers process the syrup or sugar and put it up in containers according to the needs of their trade. Maple syrup is sold in several types of containers. For the retail trade syrup is often sold in one-gallon cans or in one-pint or one-quart bottles. Sugar is sold at retail in one pound or one-half pound blocks. Maple syrup must weigh 13 lb. 2 oz. to the gallon and must not contain more than 35% water. Maple sugar must not contain more than 10% water. For the wholesale trade, syrup is frequently sold in drums containing 30 to 50 gallons. Maple sugar is shipped in blocks of 50 to 60 pounds each. A very little of this surplus goes to the United Kingdom. The bulk of Canadian exports go to the United States. It is noteworthy that Canada is the only country exporting maple syrup or maple sugar.

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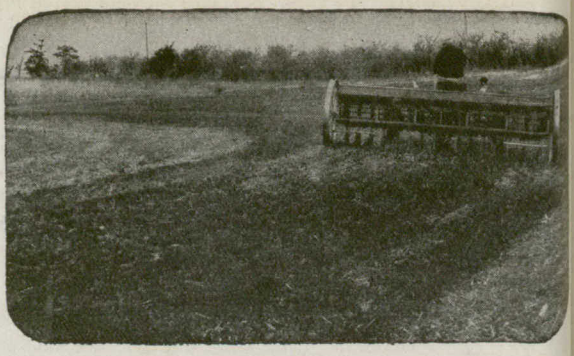

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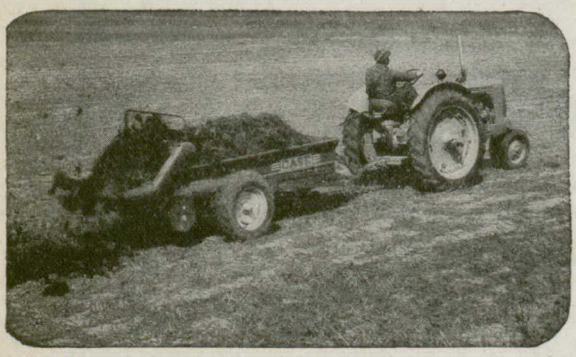

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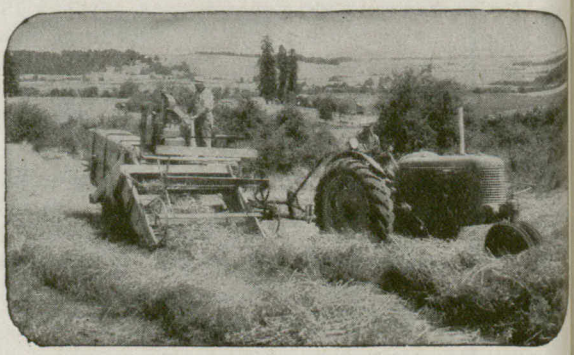

Grass and Legume Seeds are easy to harvest, more surely saved, with the extra threshing and cleaning capacity of a Case combine. Brings cash returns from cover crops. Works well from standing stalk or cured windrow.

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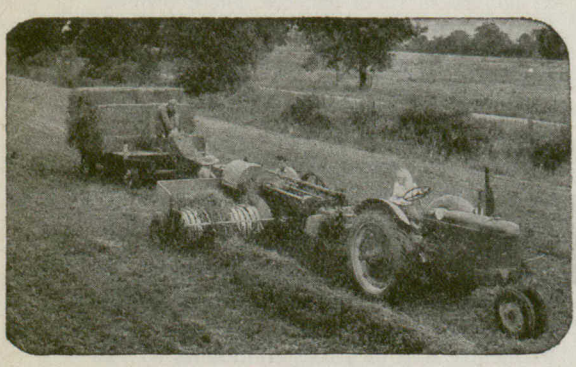

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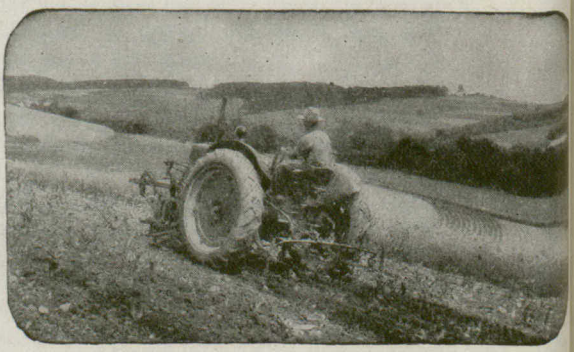

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Educational films and bulletins on contour tillage, terracing, making high-protein hay and other advanced practices are gladly available for your use. J. I. Case Co., Toronto.

The Farm Woodlot

by G. A. MULLOY

Asst. Chief, Sylvicultural Research, Dominion Forest Service, Ottawa

"About 30% of the volume and 20% of the value of total wood production in Canada comes from lands classed as farm woodlots. It amounts in value to 40 million out of a total of 195 million dollars. This is no small contribution to our national wealth and compares favourably with the value of wood production from the lumber and pulpwood industries."

IN A REVIEW of the natural resources of a country it is usual to separate the agricultural from the forest land. This is a convenient sub-division in Canada since the agricultural lands are privately owned while, except in Nova Scotia and Prince Edward Island, most of the forest land is held by the Crown, only licenses to cut being granted.

G. A. MULLOY

But when such a review of natural resources is based on production it is not so easy to separate lands on an agricultural and forestry basis because of the area devoted to farm woodlots from which, in the aggregate, a large amount of wood is produced yearly. It has been shown by the Bureau of Statistics that about 30% of the volume and 20% of the value of total wood production in Canada comes from lands classed as farm woodlots. It amounts in value to 40 million out of a total of 195 million dollars. This is no small contribution to our national wealth and compares favourably with the value of wood production from the lumber and pulpwood industries.

The importance of the farm woodlot will vary, of course, with the location of the farm in Canada. Generally speaking, there are two broad classes of farm land: —that part which was originally forested and from which the tree crop had to be removed; and that part which never had any tree crop. The second of these two divisions is known as the prairies.

On prairie farms it is not a question of managing a woodlot which already exists but of attempting to establish a grove of trees where none existed. During the last thirty years, under the direction of the forest nurseries maintained at Indian Head and Sutherland in Saskatchewan by the Dominion Government, many woodlots and shelterbelts have been established by prairie farmers. In a land where there is nothing to break the wind these plantations have been a great boon for sheltering buildings and garden crops. As time goes on and they become not only more numerous, but individually large enough, they will be an important source of wood products, which are so scarce and highly priced in this land of wide open spaces.

But for the most part, from Nova Scotia to British Columbia, and in the north, the farm woodlot in Canada is a remnant of a former forest which has been cleared for cultivation. Unfortunately in this process much land was cleared, and even cultivated for a few years, which should have remained in forest. These areas are gradually being abandoned as farms and in some places are slowly being reclaimed by forest. In other places, as no seed trees remain, the re-establishment of the forest will have to be accomplished by planting forest trees, entailing an outlay in capital and labour. Some of the provinces maintain large forest nurseries where the farmer can obtain planting stock to rehabilitate or re-establish his woodlot, free of charge except for shipping costs.

In the regions where trees were the natural cover, a certain percentage of the land should be left under forest. If possible, every farm, no matter how fertile the land may be, should have a woodlot. It is probable that in such agricultural regions about 20% of the total land area

should be retained in forest. This is not only for the production of wood but also for the health and well-being of the farming community. Wells, creeks and rivers are essential to good farming practice, and it is only by retaining adequate forest cover that the water supply of a district can be maintained. Farming practice such as ploughing is the first step in inducing sheet erosion, and while contour ploughing and other practices may minimize damage from this cause, the danger of sheet or gully erosion is always present. Strategically placed woodlots will not only reduce the severity of floods in spring, and surface run-off throughout the year, but will also assure the farmer a good supply of clear, cold water in the growing seasons and a normal water table below his growing crops.

The forest is like any other growing crop; it must be managed and harvested or it will deteriorate. Its worst enemies are fire and grazing by live stock. Hence the first requisite is that both fire and live stock be kept out of it. While cattle shelters are necessary on all farms, a few trees are adequate for this purpose. The forage in the woods is of little or no use for beef or milk production, and if the woodlot is persistently grazed the forest will eventually disappear.

Management of the woodlot for production of useful wood, either for fuelwood or building material, is accomplished by cutting under a system which will allow the forest to perpetuate itself. Under full stocking it would be possible in many of the farming communities in Canada to produce one cord or more per acre per year. This means that, correctly managed, a 25 acre woodlot will produce 25 cords of wood each year without reducing the growing stock. In fact it is necessary to cut this much to keep the forest growing at its maximum.

But unfortunately most farm woodlots do not carry enough wood capital to produce maximum returns. They have been cut into and depleted for generations until many of them are at present either worthless or their volume of production is at a low level.

From data obtained in the last two years from working plans on farm woodlots in the Maritime Provinces it was found that an average of some of the best woodlots showed a volume of only 1,440 cubic feet of wood per acre. The current growth averaged about 57 cubic feet. These woodlots should carry a capital stock of at least 2,500 to 3,000 cubic feet, which, with the same rate of growth, would produce over a cord per acre per year. It is possible by correct forest management on these good woodlots to increase the wood capital to full stocking, and at the same time, produce as much wood products as necessary for current use.

The average unmanaged woodlot contains many dead and defective trees. These, of course, can be utilized on the farm as fuel. But under full management there should never be any dead trees, except the occasional windfall. The whole object of management is to keep each and every tree growing at the maximum for its size and age. No trees should be allowed to remain in the woodlot to die of suppression or crowding, in fact, under full management, none should remain that are not growing well. They should be

An all-aged hardwood stand with many species. This stand could be improved by removing a relatively large amount of material.

cut and utilized in order to allow more thrifty trees to utilize the growing space.

Farm lands are the most fertile parts of the land surface. It follows, therefore, as a natural corollary that farm woodlots are potentially the most productive forest lands in Canada. This is indicated, in part, by present production statistics. Farm woodlots occupy only 35,137 square miles out of a total of occupied forest lands of 265,526 square miles, or a little over one-seventh of the area. Yet they account for about 30% of the total volume of wood produced. Since they are also so accessible, transportation costs are low, and it is possible to have a high production at low cost. Moreover, their accessibility allows for a very diversified market for the numerous forest products which can be harvested. Fence posts, poles, large construction timber, barrel hoops from wire birch, barrel stock, fuelwood and other minor products can usually find a ready market in the immediate neighborhood. These are by-products in harvesting wood crops, which, in the case of large woods operations, cannot readily be marketed because of greater transportation costs.

The possibilities of production from farm woodlots alone can be estimated. If only 50 cubic feet, or one-half cord, per acre per year of useful wood were produced on all these lands, the total would be about one-half the average quantity of wood harvested yearly in Canada from all sources during the past decade. There is every reason to expect that much more wood per acre for pulp or for lumber can be grown on these highly fertile woodlots than that from land hundreds of miles further north, and at the same time, as much fuelwood as needed can also be produced, much of it as a by-product. A moderate measure of forest management of farm woodlots can attain and exceed this objective.

It is evident then that a program of advice and assistance to the farmer with the object of bringing his woodlot into full production will pay dividends both to the farmer and the wood-using industries by lowering the costs of production and increasing the quality of the wood produced.

Fur Farming

by

C. K. GUNN

Superintendent, Dominion Experimental Fox Ranch, Summerside, P.E.I.

CANADA has long been recognized as the origin of valuable and luxurious fur pelts, and today the Canadian fur trade has reached an annual turnover of more than 30 million dollars. Also, spread over 10,000 fur ranches across the Dominion there is another capital investment of some 15 million dollars in breeding stock and fur ranching equipment.

The natural geographic and climatic conditions which prevail from the temperate to the Arctic Zones, have been important factors in making Canada an ideal habitat for the production of fine dense furs.

The excellent quality of Canadian furs early achieved a world wide reputation, and as a result the fur trade grew so rapidly during the French regime that it actually hindered agricultural development. In fact, the fur trading companies became so endowed with power that for decades the governmental control of much of this vast country was in their hands. The gradual expansion of colonization, and especially the indiscriminate trapping practised over a period of some three centuries, caused a diminution of fur bearing animals in the more accessible regions. However, the continued demand

"Speculation, so prevalent during the early days of fur ranching, has practically disappeared and the raising of foxes and mink has become a stable industry, which yields good returns as a reward for careful management of the fur farm.

C. K. GUNN

"Canada can go forward with the assurance that the application of scientific knowledge, the judicious expenditures of money for the preservation of wild fur bearers, and the conscientious efforts of governing organizations, fur ranchers and trappers alike, will surely preserve and expand, this, our Canadian birthright—the fur industry."

Canadian Fur Pelts

and high valuation placed upon fur pelts was an incentive, which has led in more recent years to the rearing of fur bearing animals in captivity and to the foundation of the present fur ranching industry.

Early attempts to propagate wild fur bearers under semi-domesticated conditions were met by failure, until Sir Charles Dalton of Prince Edward Island made his notable success in the rearing of silver black foxes. Shortly afterwards, the ranching of mink, raccoon and other species of fur bearers was started, but many difficulties were encountered by the early pioneers of the fur growing industry. Some technical assistance during the development of fur farming was supplied by the Government, and today the industry has gradually reached a position in which it can compete in the production of high grade pelts with those caught in the wild state.

The fur ranching industry has shown its virility by weathering the hazards of two world wars and the severe depression of the early 30's. It has also shown its adaptability in overcoming a decline in market demand, by the development of new mutant types of foxes and mink. These add greatly to the lustre of the more stable types of furs and will probably multiply the demand for new and beautiful fur garments.

As Canada assumes the role of a major export nation, the fur industry will no doubt continue to play its part as an important export, and also, the greatly increased means of travel opening up the vast Yukon and Northwest Territories augurs well for still greater expansion and development of Canadian fur resources.

The fur harvest comprises wild caught furs and those raised on fur ranches. Red, cross, and white foxes, muskrat, beaver, lynx, ermine and mink form the bulk of the wild skins with the great preponderance of these represented by muskrat, red fox, beaver and ermine. From these two sources, some 7 million pelts are harvested annually, which has given rise to an average yearly income of 15 million dollars over the past decade. During recent war years because of several factors, among which are the increased demand for furs and the advent of new, valuable mutant strains of ranch bred mink and foxes, this figure has been doubled.

Fur farms, which raise chiefly silver foxes and mink, have during the past decade produced one-third of the value of the Canadian fur crop, and with the growth of the valuable mutant types of foxes and mink they may be expected to greatly exceed this proportion in future years.

Fur bearing animals are widely distributed throughout the Dominion with some regions showing a greater production of certain kinds of pelts, depending upon the specific habitat requirements of those fur bearers. Mink, muskrat, ermine, red fox, thrive in widely different parts of the Dominion, whereas the Arctic white and blue foxes are chiefly found in the northern latitudes of the continent. In the Northwest Territories, the most important areas are south of the tree line level and particularly along the MacKenzie River Valley. Vast tracts of this land, once known as Rupert's Land, were under the rule of the Hudson's Bay Company from 1670 until 1869, until they became part of the Dominion. This Company still plays an important role in the present Canadian fur trade, with more than 40 trading posts in the Northwest Territories and 9 other stations in Northern Quebec.

Today, as in the early days of the fur trade, the majority of furs are exported from the Dominion. Over 80% of the fur pelts harvested in Canada are shipped abroad, making the fur industry essentially that of an export business. Under recent wartime economy, therefore, furs have served as an important means of foreign exchange. Exports to Great Britain, France, United States, South American Countries, Mexico, Ireland, New Zealand, and Egypt, range in value from 15 to 20 million dollars annually. Sales to these countries reached a new high figure of 26 million dollars in the year 1944, which represented an increase of 30% over that of the previous year.

Although Canada is a major country in the production of the world's fur supplies, yet certain kinds of fur pelts are imported from various parts of the world. These comprise chiefly Persian lamb, rabbit, oppossum, squirrel and raccoon skins and are obtained mainly from British West

Africa, Russia, England, France, Australia and the United States. The average valuation in peace time of these Canadian imports is 3 million dollars annually, but in recent years this figure has soared to approximately three times that amount.

Other effects of the war time conditions upon fur ranching and the fur trade in general have been in the establishment of new markets, and especially in the shifting of the great fur auction centres of the world. Originally, this prestige was centred in Leipzig, Germany. Then, at the termination of the first World War, the focal point of world fur distribution moved to London, but during the recent war, New York has become recognized as the leading fur centre of the world.

Speculation, so prevalent during the early days of fur ranching, has practically disappeared and the raising of foxes and mink has become a stable industry, which yields good returns as a reward for careful management of the fur farm.

The essential factors involved in fur farming, may be considered as those pertaining to housing, breeding, feeding, sanitation and the control of parasites and other diseases. Each phase of ranch procedure demands, on the part of the rancher, considerable information specifically adapted to the requirements of raising fur bearing animals. This fundamental knowledge was slowly acquired by trial and error during the difficult early years in the growth of the fur ranching industry.

A careful study of the most desirable fur qualities and the trends of fashion, which control the demand and the prices of the ranchers' products, is of prime importance. With the introduction of new mutations into fox and mink ranching during recent years, the fur rancher has also been called upon to extend his knowledge to an understanding of the genetical principles involved in the breeding of these new mutant fur bearers.

Fortunate indeed has been the lot of Canadian fur ranchers to date, because of their early start in the new enterprise of producing furs, also that of the trapper, who dwells in a country where nature so generously favors the propagation of fur bearers in such abundance.

Nevertheless, to maintain this leadership in the production of luxurious furs, Canada will need to be alert to guard and conserve this great heritage.

Therefore, conservation by means of special game preserves and sanctuaries, destruction of predatory animals, extension of scientific knowledge regarding cyclic mortality of small rodents serving as feed for fur bearers, control of animal reservoirs of disease, breaking the life-cycles of destructive parasites of fur bearing animals, preservation of natural aquatic habitats, rigid limitation of numbers of trappers and their catch of diminishing species of fur bearers, as well as definite measures to improve and create conditions which nurture and protect the young of fur bearers, at critical periods when their mortality rate is high —these measures would, indeed, do much to supplement natural conditions and make secure the future of Canada's wild fur resources.

Canadian fur ranchers will do well to place their emphasis upon the production of furs of good quality, because in the markets of the world there will always be a keen demand for clear colored, fine, dense furs. These can only be produced by careful attention to the many individual details necessary to the successful rearing of fur bearers, under semi-domesticated conditions.

Moreover, the establishment of a united Canadian fur organization could assist the orderly marketing of pelts and also sponsor judicious advertising which would greatly strengthen and safeguard the economy of this national industry. In addition, the adequate technical assistance, the ready availability of serums and vaccines for disease control, the complete freedom from stifling taxation, as well as a Government sponsored campaign for promotion of "The Canadian Fur Pelt" in the markets of the world would do much to further establish Canadian fur products.

Canada can go forward with the assurance that the application of scientific knowledge, the judicious expenditures of money for the preservation of wild fur bearers, and the conscientious efforts of governing organizations, fur ranchers and trappers alike, will surely preserve and expand, this, our Canadian birthright—the fur industry.

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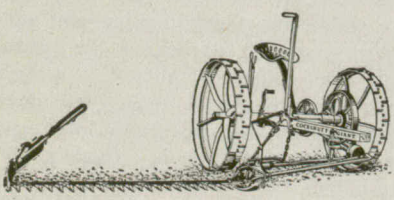

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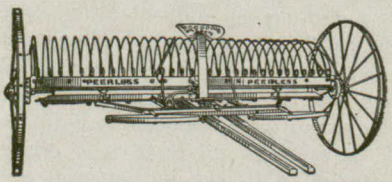

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Farm Mechanization and Electrification

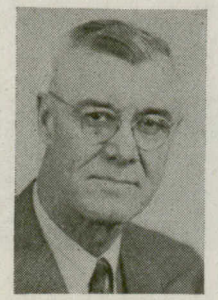
The farm way of life is being changed through the mechanization of the farm with the tractor, truck and electric appliances.

by

E. A. HARDY

Professor of Agricultural Engineering, University of Saskatchewan, Saskatoon

FARM mechanization is not complete or even economical where only a gasoline engine is used to saw wood, clean grain, and pump water, or where it is used to separate the milk and run the washing machine. The farm tractor was used to do field and belt work for years where it was also necessary to maintain a complete duplication of horsepower for haying, silo filling, and harvest. Mechanization in the field for all operations in such a way that duplication is done away with and higher quality work accomplished easily and timely, is true mechanization.



E. A. HARDY

The live stock farmer finds a need for mechanization to make hog raising, cattle feeding, and dairying enjoyable and efficient. The poultry producer finds the same need for mechanical help. The homemaker cannot compete with the other agricultural departments without careful and efficient mechanization. True mechanization provides mechanical and electrical helps in every branch of farm life. Mechanization, to be sound and economical, must be filling a need in the farm life of Canada.

Mechanization for Crop Production

The mechanization of field operations has progressed rapidly since 1900, and yet slowly. It took twenty years to produce a general purpose tractor and then another twenty-five years to streamline it, put on electric starter and lights, hydraulic arms, rubber tires and a small line of supplementary equipment so that the tractor could be considered truly general purpose. The tractor must prepare the seed bed, plant or seed the crop, cultivate the row crop or prepare the summerfallow, cut, rake, sweep, and stack the hay, or load it onto racks and place it into the barn, or haul the pick-up baler and load the bales onto racks so the bales may be hauled and conveyed either onto stacks or into the barn for feeding or market. The tractor must operate the power binder, the stook sweep, and the thresher for one type of harvest; it must haul or propel the combine for another. In the corn harvest the corn binder, the ensilage cutter, or the field ensilage cutter, the corn picker, and the corn sheller each must be operated at the correct field or belt speed for efficient and speedy performance.

The farm tractor must also lift and load beets for the sugar beet grower; cut and load peas, and operate the pea viner for the vegetable grower; haul and operate the sprayer for the fruit grower; load and haul manure for the live stock farmer; also grind grain and hammer roughage in producing meal from various crops for the concentrates in live stock feeding.

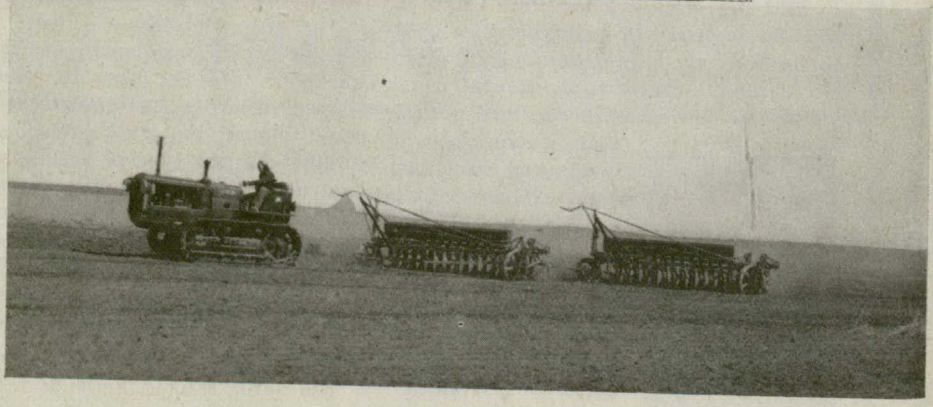
The farm tractor on rubber tires, weighted, and properly hitched, develops 20 to 30% more power than the steel wheeled tractor and does it on 15 to 30% less fuel, depending upon the service. The farm tractor on crawlers climbs the hills and pulls heavy loads with less slippage and less soil packing on 11 to 17% less fuel than the steel wheeled tractor.

The tractor equipped with high compression gasoline engine and the Diesel engine compare very favorably in the use of fuel:

Gas	*Diesel*	
30%	33%	respectively in usable power
27%	26%	respectively in exhaust gas
28%	25%	respectively in cooling the engine
10%	8%	respectively in heat radiation
5%	8%	respectively in friction

● *The old way has given way to—*

● *The new*



The cost of gasoline is high due to fuel refinement and tax. The cost of the Diesel engine is high compared to that of the gasoline engine in the tractor. The actual cost of operation of the Diesel tractor is less than that of the gasoline tractor where the tractor is used more than 1,000 hours per year.

Mechanization in the production of grain has progressed so that one man can work a section or even a one-and-a-quarter section farm with the tractor, combine, and the truck. The one man can do the spring tillage, seeding, summerfallow, and harvesting. He will only hire an extra man or a boy during harvest to truck the grain from the combine to the granary or the elevator, thus levelling off the demand for seasonal farm help.

Mechanization of the Farmstead

The most desirable power for the farmstead is electricity from the high line which will provide 110 and 220 volt alternating current. All motors and utilities are standard with those used in the city. Automatic equipment using thermostats are standard, as well as a variety of motors for power about the farmstead.

The next desirable power is 110 volt alternating current supplied by a gasoline or Diesel engine operated by remote control. Current from this system is standard for all utilities. There is no storage battery except for starting. The engine operates all of the time the lights are on. Engines of this type are high compression, operating at varying loads with reasonable efficiency. The cost per kilowatt hour is more than from the high line but not out of line for the convenience of the electrical power.

The 32 volt direct current plant with the storage battery—either engine or wind electric—is satisfactory for limited power requirements.

Finally, where electricity is not available, gasoline engines provide independent power for the washing machine, the feed grinder, the water pump, and a variety of other uses found in the semi-mechanized farmstead.

High voltage electrification is essential when any amount of power is to be used about the farm. The average farm home requires a lighting load of from 600 to 1000 watts which can be supplied by either 32 or 110 volt power. The power load, however, of 1/6 horsepower motor for the

washing machine, the vacuum cleaner motor, the mixmaster motor, the 1/6 horsepower motor on the cream separator, the 1/4 horsepower motor on the water pump of the pneumatic water system, tend to build up a power load in excess of the ordinary 32 volt system.

The lighting load in the barns, shop, and yard is not particularly high. Another 600 to 1000 watts, depending upon the extent of the barns, feed lots, and service buildings. The power load of the motor on the milk cooler ¼ hp., the electric brooder 250-500 watts, the motor for the electric feed grinder from 1 to 3 hp., the motor driving the grain elevator 1/3 hp., the motors in the shop drill 1/6 hp., grinder ½ hp., saw ½ hp., air compressor and paint spray ½ hp., all tend to point to the need of at least 110 volts where mechanization is to be effective on the farmstead.

Mechanization and the Farm Business

The returns from mechanization are manifold. Mechanization in the home, which provides light, running hot and cold water, the radio, refrigeration, the electric iron, the washing machine, vacuum cleaner, and many kitchen aids, raises the standard of living, reduces the labor requirements of the household and modernizes the farm home to the equal of any of those in the city.

Mechanization in the dairy, providing power for the milking machine, the cream separator, running water for the individual drinking cups for the cows, and radio and lights, makes the work in the barn and with the cows a pleasure. The small electric feed grinder operating during milking provides ground feed for the dairy ration without the use of the tractor or special labor and equipment.

Mechanization for feeding hogs with power for grinding grain, with running water for the automatic hog waterers, and with the self feeder which provides prepared mixed feed at all times for hogs makes feeding hogs economical and easy.

Mechanization for cattle feeding provides power for the hay mower, a power hay sweep and stacker, so that hay can be quickly cut and cured and stacked. Where hay is put in the barn, the hay loader and slings with the hay carrier loads the hay and places it in the barn with the least time and labor. Many have the mow of the barn shaped like a big self feeder so the cattle can feed themselves, a self feeder for hay holding 40 to 50 tons. Some blow straw from the thresher into the barn and cut hay, making a hay straw mix to feed to cattle. The cut feed is hauled to feed bunks or conveyed to mangers. Baled hay may be broken and fed in hay bunks or mangers or cut for mixing with a straw cutter or ensilage cutter. The ensilage cutter will usually be driven by the tractor. Running water is desirable for feeding cattle. A tank heater for winter will keep the water warm so cattle may drink without becoming chilled.

Mechanization for poultry feeding provides power for the grinding of poultry feed, lights for the poultry house, running water, and heat for the brooder and, along with self feeders, helps reduce the daily work in the care of poultry.

The farm shop is more valuable to the farm business if it is equipped with a few power tools such as a drill, grinding wheel, a compressor paint spray outfit, and power saw. All of these tools are used not only to keep the machinery in order but also to maintain the buildings. Buildings need repairing and painting, and machinery must be repaired. A few power tools are a profitable investment where power is available. Some of the larger farms support a gas welding unit and others a small electric welding outfit. The welding units are only economical where a large number of machines are operated at some considerable distance from a town with good service.

Mechanization, where mixed farming is practical, is profitable in saving labor, and modernizing the many chores which have been laboriously hard jobs. Mechanization of the grain farm modernizes the farm operations and maintenance but is not used in as many operations as on the mixed farm, resulting in higher costs with less opportunity to save labor.

Mechanization of the farm with the tractor, truck, and electrification provides mechanical and electrical helps to do the heavy hand work with power and is changing the way of life on the farm and modernizing agriculture.

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Share with the hungry!

Food Information Committee of
THE GOVERNMENT OF CANADA

NO. 1 FARM

Marketing and Processing Facilities

by

W. C. HOPPER

Principal Economist, Agricultural Economics Division, Dominion Department of Agriculture, Ottawa

CONSUMPTION of food in Canada annually amounts to about 17.5 billion pounds. This quantity includes about 1.5 billion pounds of imports. The most of this food is supplied to Canadian consumers through nearly 50,000 retail stores. In addition to food, non-food commodities of agricultural origin such as wool, tobacco, ranch furs and hides amounting to many millions of pounds are also utilized in the Dominion. All these products of agriculture must be distributed to domestic market outlets either in the raw or processed form. Only a very small proportion is purchased by consumers direct from producers.

W. C. HOPPER

In addition to the agricultural products consumed or utilized in Canada about 25 to 40% of our annual production of commodities of vegetable and animal origin is exported. Some of these exports are in processed form but all have to be transported either to seaboard ports or to points of entry into the United States.

The production, marketing and processing of food is our first, our most important and our largest industry. About one-third of Canada's total working force is engaged in primary agriculture and fishing. About one-sixth is working in food processing and distribution. About 32% of the manufacturing plants in Canada are food plants. About 12½% of every dollar invested in manufacturing is devoted to food processing and about 12% of our manufacturing labour is engaged in it.

The marketing of agricultural products is a huge and complex business. Marketing machinery of all kinds runs into hundreds of millions of dollars in value and the classification of occupations engaged in various aspects of marketing is large and diverse. Thousands of motortrucks, railway cars and steamships besides horse-drawn vehicles and the operators of these transportation facilities are involved. Hundreds of elevators, storage warehouses, wholesale and retail stores, milk and bread distributors, and many public markets in urban centres, and the persons necessary for these establishments and functions, are also essential parts of the distribution machinery.

In the field of distribution we must also include the large number of persons who act as purchasing agents, brokers, salesmen, inspectors and graders of agricultural products and their offices and means of conveyance. Enormous sums of money as remuneration for services are annually involved in the marketing of the products of the fields, gardens, orchards and stables of rural Canada.

Processing includes many different kinds of activities such as the manufacturing of flour, bread and other cereal products, the making of cheese and butter, the condensing, drying and pasteurization of milk, the slaughter of live stock and the preparation of meat products of all kinds, the canning and otherwise preserving of fruits and vegetables, killing and dressing of poultry, drying of eggs, the manufacturing of corn products, quick freezing of foods, feed mixing, seed cleaning, the manufacturing of potato starch and of tobacco and woollen products, the cleaning and dyeing of furs and many others.

Agriculture provides a livelihood for thousands of people in addition to those on the land. Transporting food from the farm to the urban table, and making the raw product into an edible form, requires large amounts of labour, railway rolling stock, numerous manufacturing and processing plants, and retail outlets.

When farming was a matter of producing crops and animal products for the immediate needs of the farm family, marketing was a simple matter but as commercial agriculture emerged from subsistence farming, machinery for marketing the surplus production above the needs of the farm family began to develop. One of the earliest methods used by farmers to dispose of surplus products was the public market in the small urban centres where tradesmen such as blacksmiths, shoemakers and the retailers of merchandise of various kinds had established their businesses and where the railroad station, the church, the town hall and the offices of the medical doctor and the notary were located. To these early public markets the farmers brought products of all kinds—grain, potatoes, turnips, butter, eggs, meat and other farm commodities.

As more efficient agricultural implements were invented and made available to farmers, as more and more land was brought under cultivation and farms increased in size, the production of food and fibre crops was enlarged to meet the needs of a growing urban as well as rural population. Public markets in urban centres became inadequate to handle the volume of products farmers had to sell.

When some commodities were produced in excess of Canadian needs an export outlet was sought and the export market gradually became more and more important to the economy of Canadian agriculture.

Facilities for transporting, storing and selling the large quantities of farm products required for consumption in Canada and for the handling of products to be exported were increased and improved as the needs arose.

Grain Marketing

Most of the wheat, oats and barley produced in Eastern Canada is fed to live stock on the farms where it is produced. However, a considerable volume of wheat is sold to flour mills and to feed-mixing plants and a considerable volume of barley is sold to feed-mixing and malting plants. The major part of Canada's gigantic cereal crop is grown in western Canada.

In the early settlement days in western Canada grain was handled in bags and moved by ox-carts. With the construction of railroads, loading platforms and grain warehouses were provided at country sidings and grain wagons replaced the ox-carts. These new facilities and the erection of country elevators, the first of which was built in 1881, made possible the handling of grain in bulk.

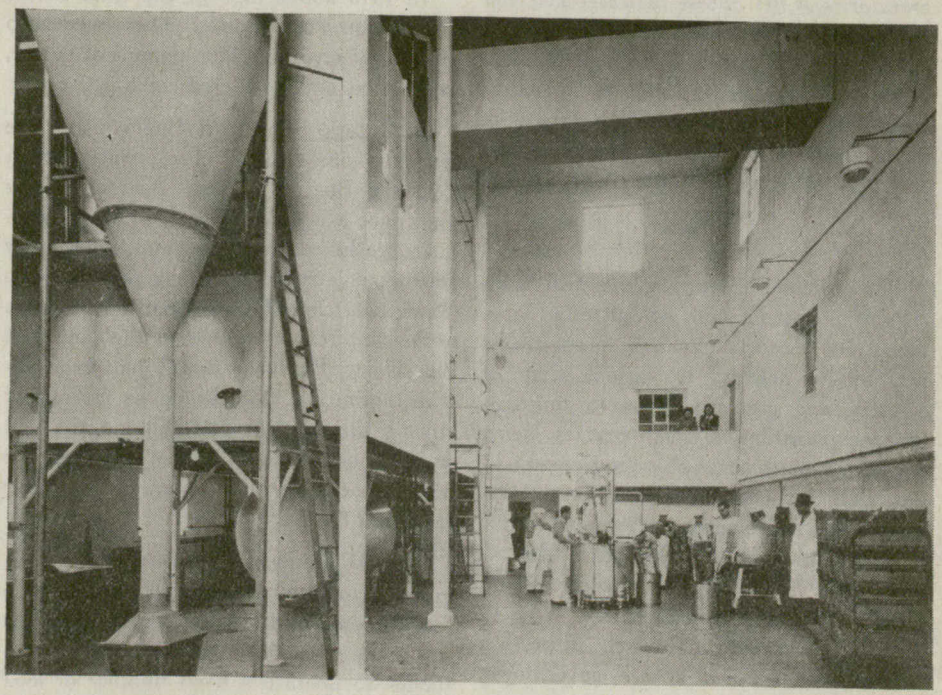
Grain warehouses have now completely disappeared in western Canada but there are still a considerable number of loading platforms for placing grain directly from wagons or motortrucks into railroad cars but usually only 3 to 4% of the western grain crop is handled from these platforms.

Country grain elevators increased from 425 in 1900 to more than 5,500 at the present time. From the country elevators grain is carried by railway cars to terminal elevators at the head of the lakes (Ft. William and Port Arthur) and on the Pacific coast. Elevator capacity at Ft. William, Port Arthur, Georgian Bay and lower lake ports, on the St. Lawrence River and at St. John, N.B., and Halifax is about 174 million bushels. Pacific coast terminal elevators can take care of about 21,500,000 bushels and the elevator at the Port of Churchill 2,500,000 bushels. These terminal elevators are ample for the handling of grain to eastern flour and feed mills and for export.

In the movement of grain from country to terminal elevators the railroads are called on to perform an enormous seasonal task. Elaborate preparations have to be made every year in conditioning grain cars, locomotives and right-of-way in advance of the actual grain movement.

In 1943-44 about 350,000 carloads of grain were inspected and nearly 40,000 re-inspected by government grain inspectors. This gives some idea of the railroad transportation facilities required for the marketing of Canada's grain in its natural state.

From the terminal elevators at Ft. William-Port Arthur, grain has the advantage of water transportation in continuing its journey eastward. In 1944 about 400 million bushels of grain nearly three-quarters of which was wheat was shipped by lake boats out of Ft. Wil-



View of egg-drying room and equipment in a modern Winnipeg plant

liam and Port Arthur. About one-half of this grain was landed at Canadian ports and about one-half in ports of the United States. In the crop year 1944-45 about 169 million bushels of wheat were used in the domestic market and about 343 million bushels were exported. Of oats, barley and rye nearly 600 million bushels were used in Canada and nearly 138 million were exported.

Of the grains produced in Canada wheat is of course the most important from the standpoint of human food, wheat flour being the chief product. A considerable quantity of wheat as well as most of the oats, barley, rye, buckwheat and mixed grains produced in Canada are fed to live stock, a substantial quantity being used as breakfast foods while a considerable amount of barley goes for the production of malt. At least one-half of the Canadian corn crop is converted into starch and other edible corn products. Oil for various uses is extracted from the flax seed crop and the oil cake residue is used for live stock feed. A portion of these grains are used for seed.

The processing of grains requires plants of many different kinds. For example, in 1942 there were 1,171 flour and feed mills, 3,023 plants making bread and other bakery products and several hundred others devoted to the manufacture of such products as biscuits, breakfast foods, malt starch and macaroni. The total capital invested in these plants exceeds 300 million dollars and about 12,000 male and female workers are employed in them.

Dairy Products

To market 17½ billion pounds of milk in various forms requires equipment and facilities of many millions of dollars in value. Of this great volume about 47% is utilized in butter production—40% in commercial creameries and 7% on farms —and about 11½% is used for making cheese. There are in Canada 1,148

creameries, 9,191 cheese factories and 247 combined cheese and butter factories. About 22% of the total milk production is sold in fluid form, about 10% is consumed as fluid milk on farms, 3½% is made into condensed and evaporated milk in concentrated milk plants, 1½% goes into ice cream and 4½% is fed to live stock.

The primary marketing function consists of collecting milk or butterfat from farms by motortrucks and horse-drawn vehicles for delivery to various kinds of country and city plants or to railroads for transportation to urban centres. Being one of the most perishable food commodities, milk for consumption in fluid form or for the manufacture of various dairy products must be handled with the utmost care if the products sold to consumers at home and abroad are to be of the highest quality. Through inspection services and technical advice, government agencies are helping private dairy companies and organizations to maintain high standards of quality.

Machinery is used to do most of the work in the preparation of dairy products for delivery to consumers. A large proportion of the milk to be consumed in fluid form is pasteurized to kill pathogenic bacteria, bottled in sterile containers and delivered to householders and to retail stores in urban centres. It is estimated that there are about 15,000 retail distributors of milk.

Because fresh milk is bulky and perishable, the bottling of milk and processing of milk into cheese and butter and concentrated milk is carried on in relatively small plants in almost every province. About 71% of the creameries, 93% of the cheese factories and 85% of the concentrated milk plants are located in Ontario and Quebec. The number of creameries, however, does not give a true picture of production as in 1944 only 53% of the butter produced in Canada was manufactured in the Provinces of Ontario and Quebec.

In 1945 about 72% of the total cheese production was exported. There were also exports of several million pounds of butter, condensed and powdered milk.

In Ontario prior to wartime controls the primary marketing of cheese was through "Cheese Boards". These Boards usually met once a week and factory cheese salesmen gathered together and sold their cheese at auction to the highest bidder. Since 1941 these Cheese Boards have been somewhat restricted due to the fact that the Dairy Products Board has been requisitioning all Ontario cheese for export during the summer and fall months and while cheese is still offered through the Board, the price both summer and winter has been fixed.

The Dominion Department of Agriculture maintains an iced car service for cheese and butter. Arrangements are made with the different railway companies to operate a fixed number of iced refrigerator cars per week during the summer months for the transportation of cheese to Montreal and Quebec for export. These cars give a "pick-up" service. Arrangements are also made with the railway companies for the operation of iced refrigerator car services from specified routes to Toronto, Montreal and Quebec for butter in l.c.l. quantities. Under this arrangement shippers of butter and cheese are provided with a "pick-up" service in iced refrigerator cars.

Cargo inspectors for all kinds of perishable products are maintained at the Canadian ports of Montreal, Quebec, Vancouver and Halifax and during the winter months at the port of St. John, N.B. Inspection service is also maintained at London, Southampton, Liverpool, Manchester and Glasgow in the United Kingdom.

During the second world war and up to the present time sales of dairy products to the United Kingdom have been arranged and handled by the Dominion Government agency called the Dairy Products Board.

Live Stock Marketing and Meat Processing

The equipment and facilities for marketing and processing meat—beef, veal, pork, mutton and lamb, offals and canned meat—includes railway stock cars, motor-trucks, public stockyards, slaughter houses, meat packing plants, refrigerator cars and cold storage warehouses. In 1945 the total production of meat in Canada was about 2,586,000,000 pounds. Of this great quantity, about 40% of the pork, 15% of the beef and 11% of the mutton and lamb were exported.

Those who produce live stock for meat sell them in different ways. The country drover takes a considerable number from different parts of Canada and these dealers in turn market the animals direct to retail meat dealers or to small or large meat packing plants or on public markets. Some primary producers sell their live stock direct to retailers of meat or packing plants. Another important outlet is through private commission merchants or co-operative associations located on stock yards. Here again the purchasers are largely retailers of meat and representatives of meat packing plants. Some unfinished live stock, mostly from western Canadian ranches, is sold to feeders located largely in eastern Canada, who finish them for slaughter. These are the principal methods used by producers to dispose of their live stock which are to be slaughtered for meat.

The stockyards constitute an important agency in the marketing of live stock. There are eleven public stockyards in Canada. Three of these are in Toronto and Montreal and the other nine in various cities in the three prairie provinces. They serve the principal live stock producing areas. In 1944 about 66% of the cattle, 58% of the calves, 43% of the sheep and lambs and 10% of the hogs marketed commercially passed through stockyards. The percentage of Canadian live stock passing through stockyards has declined in recent years because of the increased shipment by producers direct to meat packing plants.

Meat packing plants take a much larger proportion of the live stock marketed for slaughter in Canada than do other buyers. In 1944 there were 153 packing plants in Canada. In one-third of these plants Dominion Government inspectors were located. These are called inspected plants and it is only from inspected plants that meat can be sold in the export market. Many different types of activities are carried on in meat packing plants. These include slaughter of live stock, chilling and canning of meat and curing of bacon. By-products of packing plants include hides, wool, hair, lard, tallow, glands, inedible tankage, organic fertilizers such as bone meal, etc. Fresh, cured and canned meat is shipped from meat packing plants to retailers in all parts of Canada to be sold to Canadian consumers and these products are also exported in large quantities. The United Kingdom is the principal market and a small quantity goes into the United States. In order to even out the seasonal variations in live stock markets, meat products are placed in cold storage for various periods.

A small quantity of meat is sold by primary producers direct to consumers on some of the public markets in Canadian cities. About 11,000 retail stores sell meat to Canadian consumers.

Poultry Products

The chief commercial products of the poultry industry are eggs and poultry meat. Eggs are marketed chiefly in two ways. Direct sales of eggs by primary producers to retailers and consumers takes place adjacent to all urban centres. The major part of the egg production is assembled at country points, chiefly at local egg grading stations or, in more remote areas, at local stores and thence to grading stations. There are now 2,000 registered egg grading stations; some of these stations are co-operative, some privately owned and some controlled by large produce farms. They have been established in practically all heavy producing territories. Where these facilities have developed the handling of eggs by country merchants has become of little importance. At these local stations the eggs are graded and packed, and shipped to terminal markets where they go into wholesale or retail

distribution or are assembled into carlots for interprovincial or export movement.

Part of the Canadian poultry crop is marketed by producers alive and part dressed. Broilers and light chicken in the spring and summer, and fowl in the summer and early fall are mostly marketed alive. Some of these birds go to killing plants where they may be fed for a brief period before killing. Others go into the Jewish live poultry trade in the larger centres. Both eastern and western Canada are well equipped with plants with proper facilities for feeding, killing and pre-cooling poultry.

Farm dressing of the fall and winter poultry crop is fairly common but is gradually giving way to plant killing and dressing.

The Canadian poultry crop goes normally into four outlets—domestic consumption, dressed exports to Great Britain, exports to the United States, and to the canning trade. The latter trade has grown extensively in recent years and takes a large volume of stock.

In 1944 the production of eggs in Canada was about 360 million dozens. Of this vast quantity about 80 million dozens were exported, mostly to the United Kingdom, either in fresh or dried forms. There are nine egg drying plants in Canada.

Of the total production of 337 million pounds of poultry meat in 1945 about 25,500,000 pounds were exported. Canadian consumption of eggs is about 24½ dozens and of poultry meat about 27 pounds per person.

Fruits, Vegetables and Potatoes

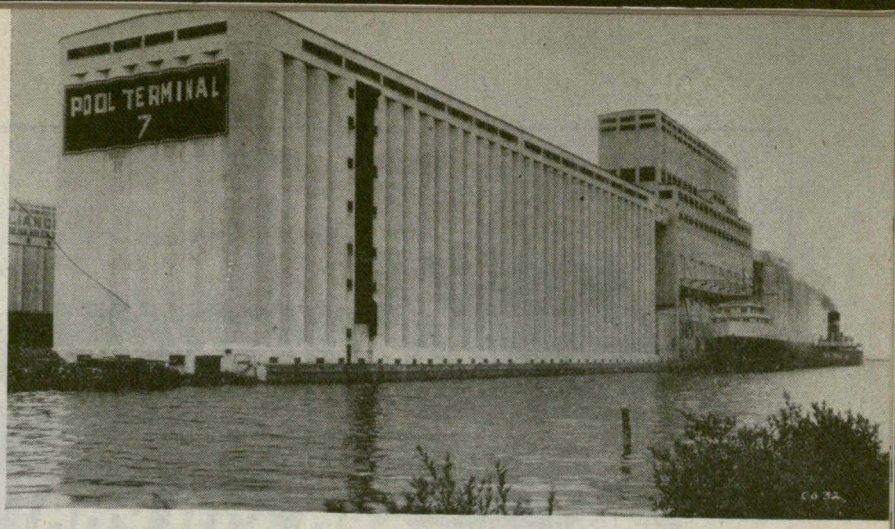
Consumption of fruits and vegetables have increased greatly in the past thirty years because of growing appreciation of the value in the diet of these vitamin-rich food commodities. In 1944 in terms of fresh products nearly 4 billion pounds of fruits and vegetables, and nearly five billion pounds of potatoes were produced in Canada. Of these about 8% of the fruits and vegetables and the same percentage of potatoes were exported. Imports of fruits and vegetables in fresh, canned and dried form amounted to about 1,186 million pounds and potatoes about 20 million pounds, calculated as fresh products.

To supply the needs of Canadian consumers with these important foodstuffs a variety of marketing and processing facilities valued at many millions of dollars are required.

Large quantities of fruits and vegetables and potatoes are sold direct by producers to consumers at retail public markets which are found in most Canadian cities, but urban consumers obtain the largest part of their supplies from retail agencies such as chain and independent retailers and city peddlars. These retail agencies fill their requirements by purchasing from wholesalers and from growers at public markets or at the farm and from growers who deliver direct to the store doors or warehouses.

Apples are Canada's most important fruit crop. In Nova Scotia most of the apple crop is delivered by the producer to packing sheds where the dealers or co-operative associations do the packing and grading. In normal times the major part of the Nova Scotia apple crop is marketed in the British Isles, and the barrel is the principal container used although in recent years a start has been made in box and hamper packing. In Ontario some apples are sold on city public markets. A large volume is sold to truckers, country shippers and dealers, some of which are co-operative associations, and in some cases the growers consign to local commission merchants or ship direct to buyers in the British Isles. The packing is done in most cases in the field or local packing shed. More apples are packed in barrels and bushel hampers than in other containers but box packing is steadily increasing. New Brunswick and Quebec apples are largely packed in barrels and bushel hampers but in these Provinces box packing has developed to a greater extent than in Nova Scotia and Ontario. In British Columbia apples are packed in boxes in local packing houses for which the grower is charged on a per-package basis and the growers' apples are pooled by variety, grade and size. A Fruit Board established under Provincial legislation regulates the marketing of the crop. The entire fruit crop is sold by one selling agency.

The major part of the Canadian production of peaches, pears, cherries and



● *A familiar scene at the head of the Great Lakes.*

grapes is produced in southern Ontario. Considerable quantities are also grown in British Columbia. Large quantities are shipped by rail to consuming centres in the various Provinces and a considerable proportion is taken by canning and processing plants located in or close to the area of production. The balance which constitutes a considerable amount is sold to truckers at the farm and by growers and truckers on nearby city markets.

Few countries in the world produce better potatoes than those grown in Canada. They are grown in all the Provinces and are marketed by motortrucks and railroads through public markets, wholesale and retail dealers and co-operative associations. Potatoes grown in the Maritime Provinces are shipped by rail to cities in Ontario and Quebec.

Most of the commercial vegetable gardeners are located close to Canadian cities and market their production on local public markets, to retail stores, chain store warehouses or through commission merchants. Early vegetables from southern Ontario and British Columbia are shipped by rail to buyers in Canadian cities. A large volume of vegetables particularly tomatoes, peas, corn and string beans are canned.

Cold storage facilities and refrigerator cars are used extensively in the storage and transportation of fresh fruits and vegetables. In 1944 there were in Canada 458 fruit and vegetable processing plants, of these 192 were in Ontario, 143 in Quebec and 62 in British Columbia.

It is obviously impossible in the space available to deal with the marketing and processing of Canadian agricultural products in any detail. The above paragraphs show in a general way something of the methods and facilities employed in the marketing of grain products, meats, dairy and poultry products, fruits, vegetables and potatoes. The processing of these products is also dealt with briefly.

There are many other agricultural commodities which are produced, marketed, and in most cases processed, in Canada, such as, honey, maple products, clover, alfalfa and grass seeds, wool, fur pelts, hides, beets for sugar, tobacco, field and soy beans, live cattle, horses and fur animals. All these commodities require facilities for distribution to various domestic and export market outlets.

To describe in detail the methods used and the equipment, buildings and vehicles required in the marketing and processing of any one Canadian agricultural product would require many pages. The purpose of this brief review of the subject is simply to indicate that a story of Canadian agricultural resources must include a reference to the facilities for marketing and processing the products of the agricultural industry. Canadian libraries contain considerable available literature on this subject in the form of books, reports, bulletins and articles.

A considerable amount of research work has been conducted, is underway and is planned in connection with the distribution at home and abroad of Canadian agricultural products with a view to improving methods and facilities so that costs may be reduced and market outlets expanded.

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Industrial Use of Agricultural Products

by

W. H. COOK

Director, Division of Applied Biology, National Research Laboratories, Ottawa

INDUSTRIAL raw material may originate from three kinds of agricultural products. First, from industrial crops, such as flax, and new crops of this type that might be developed. Second, and superficially the most attractive economically, is the utilization of wastes from existing crops, since these wastes are of little or no value at present. Third, there is the possibility of converting surplus or low quality food crops to industrial use. It is the purpose of this article to review some aspects of these three possibilities.

W. H. COOK

Although agricultural products are used primarily for food, inedible crops, e.g., flax and cotton, and by-products of animal production, e.g., wool and hides, have contributed substantially to the world's agricultural economy. Even edible crops have existed in surplus proportions and outright destruction or curtailed production rather than expanded utilization have been used in an effort to improve prices. It is impossible in this article to list, far less discuss the many industrial uses for farm products that exist at the present time. The extent to which existing crops and industrial uses can be expanded depends on agronomic and economic factors that cannot be predicted. The greatest contribution to the future agricultural economy lies in finding *new* industrial crops and *new* uses for existing wastes, surpluses and low grade products, and this article will be confined to this phase.

During the world-wide economic depression that preceded the war, existing surpluses and depressed prices aroused considerable interest in finding industrial uses for farm products. The solution of this problem was not as simple as it was made to appear. Enthusiastic chemurgists sometimes substituted wishful thoughts for facts, looked for the solution of economic problems in scientific laboratories, or considered laboratory discoveries equivalent to commercial production. It is necessary to examine the position more critically, recognizing the difficulties, economic or otherwise. On the credit side, the chemurgy movement did stimulate research in this important field—the essential preliminary to the discovery and development of new uses.

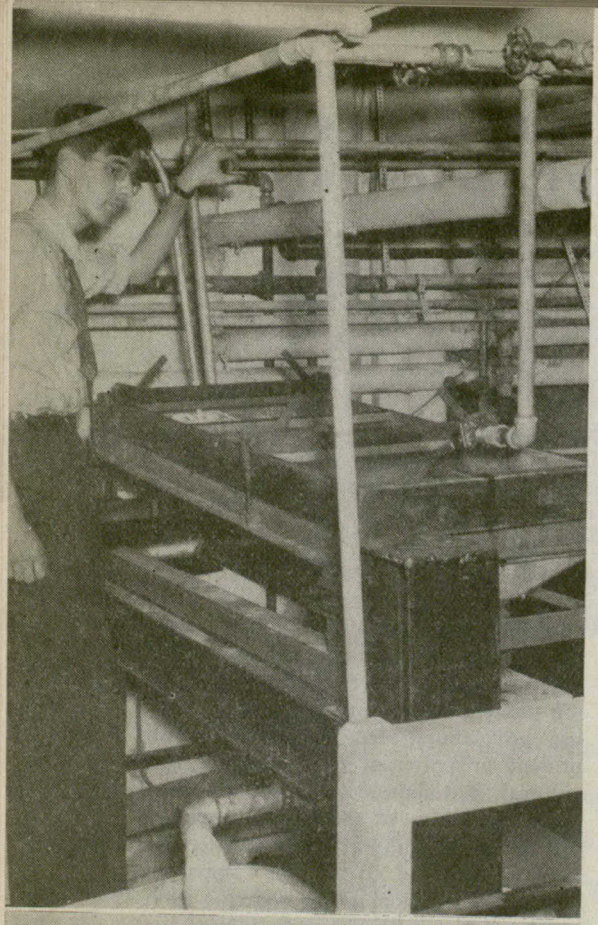
Basically, the difficulties arose from the volume and value of agricultural crops. The volume is so large that apart from fuels, pulp and paper products, or building materials, no single industry could use any appreciable proportion of the present or potential production of agricultural materials. Food use establishes the value of most agricultural products, and this is generally at a higher level than industry has had to pay for comparable raw materials from other sources. Alternately, if the prices drop to a level that industry could afford to pay, they would not yield an attractive return to the farmer.

New Industrial Crops

Linseed and fibre flax are probably the most important industrial crops grown in Canada. There is need for continuing research on flax, both agronomically and technically.

Linseed flax has never been a particularly popular crop and production has varied widely. This suggests a need for improvement agronomically. During recent years much research and development work has been done on linseed oil, and as a result of fractionation and treatment it has been possible to produce materials that could replace products previously obtained from imported oils. Research on this subject is continuing at the Prairie Regional Laboratory, Saskatoon, but the future prospects depend largely on the return this crop will provide in comparison with food crops.

Fibre flax has been produced in substantial acreage during the war period. Studies on production and retting proce-



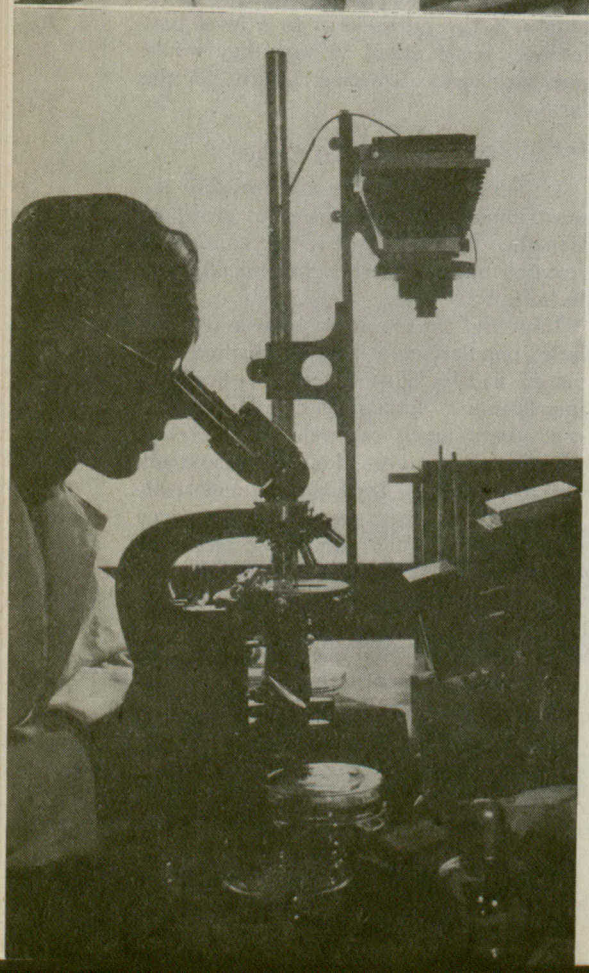
Screen separation of gluten and starch in wheat-starch pilot plant. Gluten is washed with stream of water and starch milk delivered below.

dures, and the development of labour-saving machinery both in the field and the mill have been conducted by the Dominion Department of Agriculture. The new pilot plant established by the Department in Portage La Prairie will continue these studies. Forecasts are speculative but fibre flax production may reasonably attain a level of 25,000 to 50,000 acres annually if new procedures are successful in reducing production costs and improving quality.

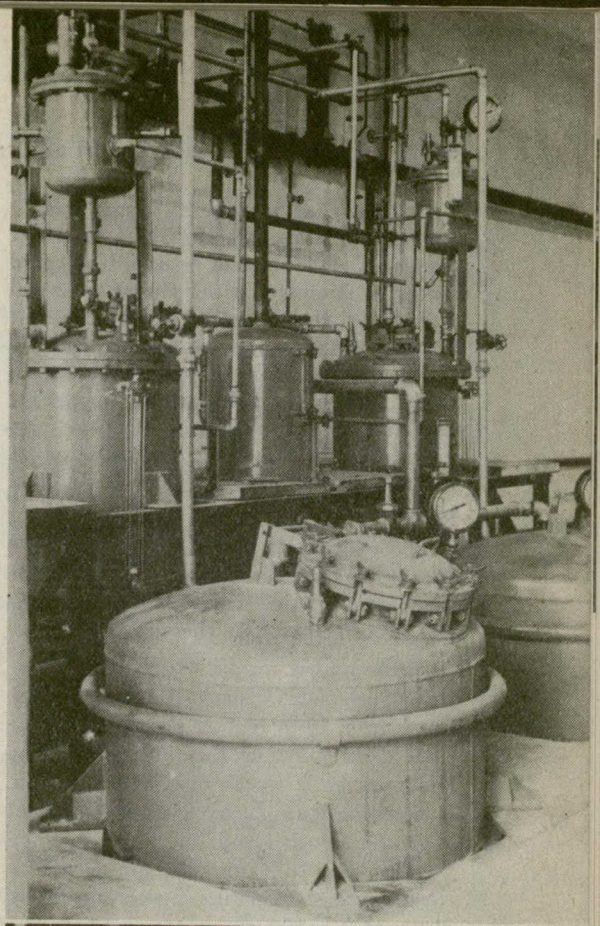
The development of new crops for use as industrial raw materials is largely an agricultural problem. There is a well established need and price level for cellulose, starch, oils, etc. Can new crops be developed that will yield cheaper cellulose than wood and still give the farmer a satisfactory return? Can an industrial potato of high yield and starch content reduce the cost of industrial alcohol? Such crops would expand agricultural production and diversify the output. This approach is difficult but it has attractive possibilities.

Utilization of Wastes

The utilization of waste materials, originating from food or other crops, should increase the return to the farmer or reduce prices to the consumer. Either, or both, would have a favourable effect on agricultural production and consumption. The wide variety of wastes cannot be dealt with in detail but the majority are available at low cost, and their composition is similar since they consist primarily of cellulose, hemicellulose and lignin. Most of these materials, such as straw, originate on farms and their utilization in industry would involve the



Isolation of organisms for fermentation studies is based on their morphological characteristics, fermentation rate, and the type of product produced. Photograph indicates one of the steps in making isolations of effective organisms.



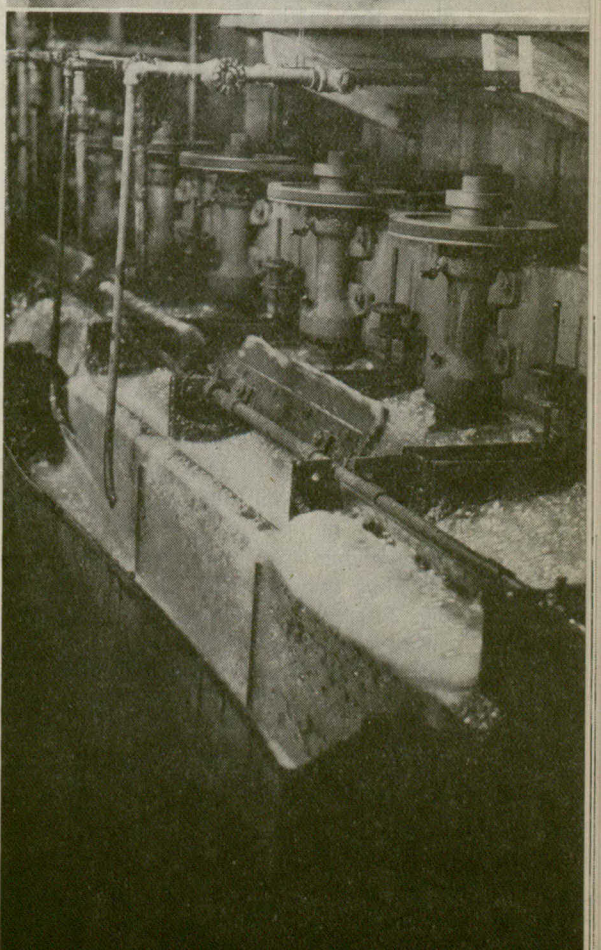
A corner of the fermentation pilot plant showing closed fermenters and propagators.

cost of collection and transport. A portion of these wastes, such as oat hulls, etc., originate where the primary product is processed, and although the quantities at any one point may be relatively small, collection costs are avoided, and this class of material would appear to have attractive possibilities.

All the evidence indicates that straws and scattered wastes would cost from four to five dollars per ton at a suitably located factory of sufficient capacity to enter into economic competition with those producing similar end-products from wood. Collecting and transport costs are such that the farmer would receive only a quarter to a third of this amount. Supplies and markets would determine the size of factory and the cost of processing and even the best possibilities would appear to be marginal at the present time. While some details of the technical processes could be improved, the basic procedures are well known.

The manufacture of paper would use only the cellulose fraction or 35 to 40% of the dry weight of straw. In a large plant, it is estimated that paper could be made from straw for about $65.00 per ton assuming the raw material cost to be $5.00 per ton at the factory. As paper from wood usually sells at a somewhat lower figure, paper plants using straw will probably not come into existence until wood prices rise. Special straws for the manufacture of special papers appear much more attractive. The Howard Smith Paper Company are now using straw from linseed flax for the manufacture of cigarette and other specialty papers and paying eight to ten dollars per ton at their plant in Winnipeg.

Certain chemicals could be manufac-



Water insoluble materials, such as resins and oils, can be concentrated by froth flotations of cooked mill slurries. Photograph shows flotation cell in pilot plant used to obtain fermentations of resins and oils.

tured from a portion of these wastes. Lignin is of little value for this purpose at present. Cellulose could be used but would have to compete with similar material from wood. Hemicellulose represents about 25% of certain wastes and could be used for the manufacture of furfural. It seems likely that the present requirements for this and derived chemicals could be provided from wastes that are collected at central points, such as oat hulls, flax shives, etc.

The conversion of straws to insulating boards or fuel would use a much higher proportion of the straw than the manufacture of cellulose or chemical products.

In the prairie region, where most of the straw originates, insulating boards are worth from 10 to 15c per board foot. Since their density is low this means that the end product is worth over $100 per ton. Even if the material made from straw had a greater density and lower value, there would appear to be an adequate margin to cover the cost of processing or any ingredients that might have to be added. The need for insulating material would appear to be great enough to permit the establishment of a factory of economic size.

The conversion of straw to fuel would result in a material having a somewhat lower heat value than western coal that sells for 5 to $10 per ton in most prairie areas. This conversion would also appear to have possibilities if suitable methods can be devised for accomplishing the operation on the farm, and thus avoid collection costs.

Sulphite liquor is a waste product from paper plants and contains up to 1.5% of fermentable sugar. This has been converted to alcohol and such a process might be of interest in connection with the manufacture of paper from straw. By providing mineral nutrients and aerating the fermenting vessels, yeast growth rather than alcohol production can be induced. The yeast can then be removed, dried, and used as feed. This process may be of interest in parts of Canada, such as the Maritimes, that are normally short of high protein feeds. Details for these processes have been worked out in both laboratory and pilot plant studies, and some are now in commercial operation.

Utilization of Surplus Food Crops

The effective utilization of surplus food crops for industrial purposes will always be difficult. Periods of surplus production alternate with periods of limited supply or outright scarcity. Under these conditions grain prices vary widely, and the cost of the raw material at peak prices would halt industrial operations, if indeed any raw material could be obtained. This applies to large-scale operations of sufficient magnitude to deal with periodic surpluses. For small-scale operations that could utilize low grade or damaged grains, there should be available in Canada a constant supply of raw materials at reasonable prices. It should be entirely possible to establish a sound industry on this basis, that would be helpful in dealing with surpluses when they arise although it may not solve the problem.

In considering the industrial possibilities of grains, the choice is limited to those uses that will yield a final product of sufficient value to give the farmer a reasonable return. Many of the proposals put forward during recent years have failed to meet this requirement. Some of the more promising possibilities have been investigated in the Division of Applied Biology, National Research Laboratories, Ottawa, and will be discussed briefly.

Starch Production from Wheat

Starch is required for a number of industrial purposes and also for the manufacture of dextrins, syrup and glucose. For most uses starch from different plants can be used interchangeably, and it is usually made from the cheapest raw material. In Canada, corn supplies most of the requirements, potatoes, a smaller amount, and wheat is used to only a minor extent. Although corn is generally cheaper and contains more starch it would appear that, since wheat is the predominant grain, there should be sufficient low-grade material of a "starchy" type and second grade flour to provide Canada's starch requirements. Adequate statistics on Canada's starch requirements are not

available, but at the present high level of consumption, it is estimated to be the equivalent of 5,000,000 bushels of wheat annually, if it were all produced from this source.

Corn starch is prepared by a wet-milling process that has not as yet been applied successfully to wheat. Indeed, the gluten in wheat has added to the technical difficulties. It has now been found that if the flour-water dough is prepared, aged, and then made into a slurry with an excess of water the gluten and starch can be separated by means of special screening procedures. This process is continuous and from a technical standpoint it should put wheat in a better position to compete economically with corn for starch production.

Fermentation Products

Most food crops are about half carbohydrate. Fermentation is one of the most promising methods for converting this portion to industrial materials. The constituents need not be separated since the fermentation reactions are relatively specific and cause the minimum of change in the other components. Different organisms produce a variety of alcohols and organic acids. New organisms and procedures have recently been developed in the laboratory for the production of glycerin, butylene glycol and lactic acid.

Ethyl Alcohol—Alcohol for industrial purposes is obtained from the cheapest raw material, usually molasses, although waste sulphite liquor from paper plants and synthetic alcohol now compete in the low price field. Alcohol from these sources can be produced for as little as 35c per gallon if sufficient quantities are required. War-time experience with grain, when the cheaper raw materials were lacking, has shown that 60 lb. of grain yields 2 gallons of alcohol and 18 lb. of dry feed; the strict processing cost is about 20c per gallon, and the extra cost of malt 5c per gallon. The principal cost item is the grain and this cannot be predicted, but it may be assumed that the value of the recovered feed will pay about a third of the grain

cost. Since 2 gallons of alcohol are obtained from the remainder, the price per gallon will be one third the cost of a bushel (60 lb.) plus 25c. It is evident that at any reasonable price level industrial alcohol from grain could not compete with alcohol from other sources.

At the present time there is no evidence that a substantial market for industrial alcohol will develop. Commercial experience since 1943 has shown that butadiene, needed for synthetic rubber, can be produced more cheaply from petroleum by-products than from alcohol. Much has been said about power alcohol for use as motor fuel. While this would provide an outlet for up to 50,000,000 bushels annually, the product would then enter into competition with gasoline, a product worth only a fraction of the price of industrial alcohol from the cheapest sources.

Other fermentations—In the above circumstances, attention has been turned to the production of more valuable fermentation products that promise to give the farmer a reasonable return—at least for low grade products. One of these, the bacterial fermentation that yields butylene glycol and alcohol, has been studied in the laboratory and is now in the pilot plant stage. One immediate use for this product is as a permanent antifreeze similar to ethylene glycol, and it can be converted to a number of other materials that may have important industrial uses. This fermentation yields about a gallon of glycol and two-thirds of a gallon of alcohol from a bushel of wheat. The cost of converting wheat to glycol and alcohol by this fermentation will be greater than that for converting wheat to alcohol, but at present the glycol is worth at least twice as much as alcohol. The potential market for antifreeze in Canada is estimated to be about a million gallons annually, but as part of this requirement would be filled from current sources, the production of glycol for this use alone would probably consume less than a half million bushels annually.

Future Possibilities

Food uses have been, and will remain, the major outlet for Canada's agricultural production. The industrial use of farm crops, particularly flax and certain by-products, has nevertheless contributed to our agricultural economy in the past—particularly during periods of war. Technically, it is quite feasible to convert many existing wastes, surpluses and low grade products to industrial materials, but up to the present the majority of these have been marginal or unfavourable economically. New technical developments, price advances in competitive raw materials, or an increase in population, may make some of these marginal possibilities economically-sound enterprises relatively soon. The future outlook is for a proportionally greater increase in the industrial uses, as compared with food uses, for farm crops. Industrial uses will assist in diversifying production, establishing industries and extending the regions of agricultural production.

Canada's Contribution to World Food Requirements

Sixty years ago over half the people in Canada were needed to feed the remainder of the country. To-day we need less than one-quarter of the population to operate the farms and we are going into the post-war period with a plant geared to produce 40 to 50% above the pre-war level. The export market is vital. The ability to export will be influenced greatly by the national measures or controls exercised by various governments to channel, impede, restrict or promote international trade.

by **FRANK SHEFRIN**

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CANADA is known as a "surplus" food producing area. She exported an estimated 44% of her total agricultural production in 1943. Since the beginning of the twentieth century she has been a substantial net exporter. During periods of emergency such as the war years her relative contribution to world food needs increased markedly. Canada will continue to contribute through exports to world food requirements to the degree she maintains and expands production.[1]

F. SHEFRIN

This article relates to the years that lie ahead. During the next year or two there will be need for all the foodstuff the farmers of Canada can turn out. All over the world people are asking for more food. Canadian farmers operating a five billion dollar industry during the war years 1940-45 have produced annually one and one-half billion dollars worth of farm products. The net value of agricultural production adjusted for changes in wholesale farm prices reached an all-time high for the period 1920-44, of $1.9 billions in 1942. During the war years production exceeded the output of the thirties (depression and drought), and of the prosperous twenties, when the highest net value obtained was $1.5 billions. Wartime farm output is no real guide to increased production for a great part of the national resources were being used to raise armies and navies and equip them for battle.

Canada's climatic and soil resources have made possible the production of a great variety of farm products. These resources have also made possible an annual production in excess of domestic requirements. During the war years additional effort on the part of farmers has made available a greatly increased volume of food for both domestic and world consumption.

Nobody can estimate how much farmers could turn out in peacetime if Canada should decide that food and fibre were needed more than anything else. From a practical standpoint, agriculture's physical capacity to produce is a function of the resources — land, labour, capital and management—that Canadians are willing to invest in it. Hundreds of thousands of additional people on the land, well equipped and organized and farming intensively, could expand markedly total farm production.[2]

What are Canada's present agricultural resources? What are the prospects for increased production? Sixty years ago over half the people were needed in agriculture in order to feed the remainder of Canada. To-day we need less than one-quarter of the population to operate the farms.

The farm population which was 32% of the total in 1931, declined to slightly over 27% by 1941. The greatest percentage decline occurred in the Maritime provinces. Saskatchewan has the highest proportion of population engaged in agriculture with 57% living on farms. The

[1] It should be noted that the production capacity of agriculture is more than just a physical concept. Demand is a factor too. It influences the volume and pattern of farm production through its effect on farm prices and incomes. However, it is not the purpose of this article to deal with the demand forces. Nor is it intended to touch on the many problems of international trade. By contribution, we do not mean giving away, but what quantity Canada can produce for export in terms of world food stocks.

[2] At the same time an increase in agricultural production may give a powerful downward push to the average level of living of farm families, unless the long run demand for food and other farm products increases beyond all expectations.

great surplus food producing areas of Canada are still predominantly rural. However, the trend is toward a declining farm population. During the war years about 286,000 people left the farms for the cities and it is likely that only a small percentage will return.

The extent of the expansion of agriculture, in space, is shown by the fact that during the sixty years between 1881 and 1941 the amount of land used for farming increased from a total of 45 million acres to 175 million acres. Farmers improved this farmland too. In 1881, 22 million acres of farmland were classified as improved. By 1941, improved land had reached a total of 92 million acres. In 1881 land sown to grains such as wheat, oats and barley, occupied 15 million acres. By 1941 grains sprouted on 57 million acres.

Wheat production has made Canada one of the biggest breadbaskets in the world. In 1881 only 2.4 million acres were planted to wheat, yielding 32 million bushels. It was during the first World War that acreage and production of wheat expanded most rapidly, particularly in the three Prairie Provinces. The wheat acreage in Canada in 1914 was just over 10 million acres but by 1919 it exceeded 19 million acres. The production of 393 million bushels in 1915 saw the Prairie Provinces produce an average of 26 bushels of wheat to the acre, a record which still stands. Acreage continued to expand between the two Great Wars. By 1940, 28.7 million acres were sown to wheat, giving a yield of 540 million bushels. This yield was exceeded only in 1942. Other grains have shown similar, though less rapid expansion in production.

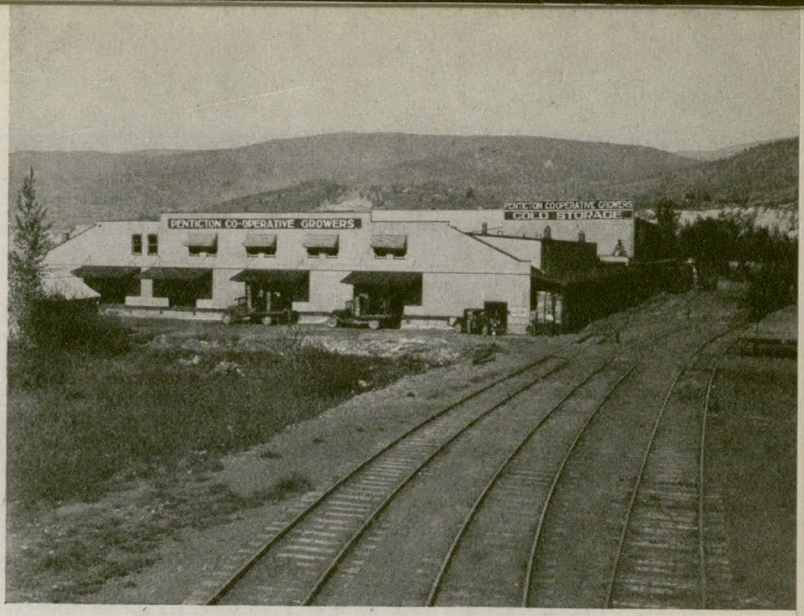
Present trends indicate that the course of agricultural production will continue upward. Farmers are going into the post-war period with a plant geared to produce 40 to 50% above the pre-war level. It was not just the demand created by the war nor the favourable weather that brought about the increase of the past six years. It was the ability of farmers to take advantage of technological advances. For example, consider the use of fertilizer. The annual use of mixed fertilizer increased from an average of 177,000 tons in the 1935-39 period to over 456,000 tons in 1944, an increase of 157% over the pre-war period, although supplies of many fertilizers were tight during the war.

Mechanization has increased rapidly since the 1914-18 war, with the Prairie Provinces taking the lead. In 1921, there were 47,500 tractors in Canada. In 1941, the total had reached 159,000. Today, 60-horse-power Diesel Caterpillars can do a job of clearing timber which seemed to be impossible at the beginning of the century. The number of combines, reaping and threshing in one operation, more than doubled in the 10 years between 1931 and 1941. During the war years 1940-44, farmers spent a quarter of a billion dollars on farm machinery.

More and improved machinery will continue to make farm production increasingly efficient. Mechanization has resulted in greater production per farm worker and per acre. Today the average Canadian farm worker, with the use of machines and science, works about 85 acres of improved land, as compared to 52 acres in 1911. The use of mechanical power not only directly increases efficiency of farm production but also, by replacing horses and mules, it frees acreage, once used to feed those original sources of farm power, for food production.

There are also the effects of better plant breeding. The farmer can now get about 60 bushels of hybrid corn per acre where previously he got only 50 bushels from the standard varieties. He can now grow wheat in the Peace River country in northern Alberta, where 25 years ago it was considered a gamble. Perhaps their greatest triumphs have been the development or discovery of varieties that survive the drought, disease, and parasites. Farmers who have been almost whipped by short growing seasons, dry weather, rust, smut and other hazards, have been given a fresh chance by new plants such as hybrid corn, Marquis, Thatcher, Renown and Redman wheat, stem sawfly resistant wheat (Rescue), crested wheat grass, and rust and smut resistant oats. But this success is only part of the progress that plant scientists expect to make.

Another factor leading to increased productivity results from soil and water conservation practices. The improved use of resources means more of the best farm land being used for crops and more of the



● *Products for export are prepared in many such up-to-date co-operative plants as shown here.*

less productive land for grass and trees. Drainage and irrigation have enabled and will continue to enable much land to be cultivated. Fertile land in Ontario and Quebec, on which crops often had wet feet, has been drained. Dyke lands in the Maritimes and British Columbia have been reclaimed from the ocean. It is planned to reclaim more land. In every province evidence may be found of wind and water erosion and techniques have been developed to conserve land resources. In the Prairie Provinces the Prairie Farm Rehabilitation program in the thirties has given aid in the work of conservation of water supply and the development of "community pastures". These pastures have made possible greatly increased live stock production. In those sections of Alberta and British Columbia where little rain falls, irrigation has made possible the production of intensively cultivated fruit and vegetable crops. In some areas it has enabled feed supplies to be built up. Also, some fertile new land will be brought into production in the next few years.

The live stock population has increased between 1910 and 1944. Beef cattle and hogs show the greatest secular increase. Live stock production per unit also can be expected to continue its rise by reason of better strains, better methods of disease control, and improved feeding practices. It is estimated that hens now lay on the average about 116 eggs each per year. Twenty-five years ago the total annual lay per hen was about 75 eggs. Cows yielding 5,000 pounds of milk are considered average. By artificial insemination, a bull can breed 1,000 cows.

Developments in the use of insecticides alone have brought insect pests more and more under control. The checking of plant and live stock diseases and of pests can greatly increase the amount of crop and live stock products that actually get to market.

The sum of these influences indicates greater total output. It is difficult to make an exact estimate. The full effect of all these changes is yet to be felt, for the new techniques and practices are not used extensively. Still further adjustments will be necessary as technical progress continues.

There are factors that probably may operate so as to limit production. One of these influences is weather. The vagaries of weather may bring back the dry years of the thirties. If we are going to restore and improve Canada's soil resources it may be necessary to increase the percentage of hay and pasture land and decrease that of crops. The total increase in volume output is also limited by the fact that the capacity of farmers to produce more food should be consistent with good levels of living for farm people.

In summation, it is difficult to estimate the top limit of Canada's physical capacity to produce foodstuffs. Canadian production today, well above pre-war levels, will likely increase. Even in a depression total output is not likely to decline very much. (Continued on page 373)

Domestic Food Consumption Outlook

The domestic market consumes the major portion of almost all Canadian farm products. Wheat and cheese are the principal exceptions. On the whole, the percentage, which domestic disappearance represents of total agricultural production, has remained relatively constant. What are the prospects for increased domestic consumption? These prospects will depend upon the size of population, the level of purchasing power, the dietary habits and the nutritional standards.

The population of Canada, as estimated by the Dominion Bureau of Statistics, will reach a maximum of about 15 million toward the end of the century as compared to 11.5 million in 1941 if the trend towards smaller families continues, and no large-scale immigration occurs. There will be more workers in the older age groups, fewer children and more old people. This is in contrast to the beginning of this century when population increased rapidly because of the impetus given by European immigration. The rate of increase slowed down after 1920.

Although no estimates have been made as to the likely total volume of food production in 1951 or 2000, it is obvious that the rate of population growth in Canada will not equal the rate of production increase. Canadian farmers will have more foodstuffs available for consumption abroad.

Greater consumption per capita and improved diets may result in a greater domestic consumption. Obviously the immediate problem is to get enough food to famine stricken countries, but five years hence, as in pre-war years, the major emphasis will be toward better nutrition. All post-war planning programs include a section recommending that government policy formulate measures designed to improve the diets of people. The application of better nutritional standards will increase the total volume of food consumption. This is borne out by wartime experiences when most consumers had high purchasing power. The supplies of food moving into civilian consumption throughout the war period, with few exceptions, increased over pre-war totals. The consumption of milk and milk products per capita in 1944 increased 21% over the pre-war average total. Total meat consumption, in spite of rationing, was up 26% in 1944. The volume of eggs moving into civilian consumption had expanded by 19%.

Exports

Canada exports a considerable proportion of her farm food production. The percentage of farm production entering into the export trade in the period 1930 to 1943 is estimated to have ranged from 15 to 44%.[1] These variations are, in part, due to the international trade restrictions in the thirties, and, in part, due to the fluctuation in total output. Canada's major food exports are wheat, meats (beef, pork, lamb and mutton) cheese, manufactured milk products, eggs, poultry meats, apples, maple sugar, honey and beans.

Exports of Canadian produce of farm origin increased substantially during the period 1930 to 1944. The value (corrected for changes in wholesale farm prices) reached a high of almost one billion dollars in 1944—almost three times the value of exports in 1930. During the war years between 1940 and 1944 the export value of farm products doubled.

For individual commodities the percentage of production exported varied considerably, both between products and between years. Consider the classic example of wheat. In the 1926-29 period, Canadians were able to ship out 70% of this grain. During the war years 1940-44 Canadians sent out 63% of their wheat production. On the other hand, the bulk of oats and barley find their way to the world consumers' table through steak, bacon, and lamb chops. Almost half of our apples are sent abroad. About a third of the hog products and a third of the beef cattle are available for foreign use.

The United Kingdom, our best cus-

[1] In order that all commodities could be totalled and treated together it was necessary to calculate the percentages on a value rather than on a volume basis. For each individual commodity the same unit value was used for calculating values of production, exports, imports and domestic disappearance. The value at the farm was used in all cases. Whenever possible changes in stocks of commodities were taken into account in the estimates of domestic disappearance. They were not, however, taken into account in the calculation of the relationship of exports and imports to production. These calculations were made by the Agricultural Branch, Dominion Bureau of Statistics.

tomer, takes a considerable quantity of food products. The United States ranks second. However, Canadian food products, both in peace and war, go to all parts of the globe. In 1929 Canadian farm foods found their way into 65 countries. By 1939 our foodstuffs were being consumed in 92 countries. Even during 1944, with blockades, submarine menace, shipping shortage and export controls, edible farm products reached 69 export markets.

Canadians may not have furnished "a quart of milk for every Hottentot" but they shipped their farm foods to Siam, to Sierra Leone, to Korea, to the Belgian Congo, to the Fiji Islands, to China and to Australia, as well as to Latin American and European countries.

Foods of farm origin are shipped out raw and processed. Wheat is shipped abroad as grain, flour or biscuits. Live stock leaves Canada on the hoof, in cans, as fresh, chilled or frozen meat. During the war years edible offal became a staple export. Horses are leaving the country as beasts of burden, and as canned meat. Apples leave Canada fresh, evaporated, as applesauce, and as juice. The tomato is exported as a juice, a paste, a puree, a pulp and a soup. Milk has gone abroad as cheese and as powder. During the war years, on occasion, the dehydrated egg was the only form of egg available in the United Kingdom. The sap of the maple trees reaches the United States market as maple sugar. Canada also ships out seeds, live stock for breeding purposes, and grains for live stock feeds.

It is true that Canadians have bought food products from abroad, but the rate of imports to domestic production has never been high and for most commodities is of minor importance. Imports have been in the nature of citrus fruits, bananas, nuts, cocoa, tea, coffee and rice. Canadians have also imported some meats and other foods produced in this country.

Canada's contribution to world food requirements must be looked at from a proper perspective—a world perspective. Pre-war studies indicate that Canada was not the most efficient producer in the world. Canada ranked sixth in net output per farm worker and persons fed per farm worker.[1] New Zealand, Australia and the United States showed a higher relative labour efficiency.

In dealing with world production and export statistics, the last complete year we have is 1938.[2] Using that year, we find that Canada having only 7% of the world's wheat area and producing 6% of the total world output was the largest exporting nation in the world. Since 1924 Canada, on the average, handled about 30% of the world's wheat exports.

Only 2% of the world's population of cattle and hogs are to be found scattered on our 732,000 farms. About 10% of the world's exports of cattle came from Canada. A similar proportion of hog products moved to foreign markets, making her one of the leading hog exporting nations.

Canada producing about 5% of the world cheese supply is one of the major exporting nations. Next to the United States, this country is probably the greatest apple exporting country.

It is important to remember that Canada's list of food exports is small in terms of the variety of products that enter the export market. On the other hand, it is estimated that only 6% of the world food production enters into intercontinental trade[3] as compared with an average of 25% for Canada.

Future Trends

It is safe to assume that improved nutrition and increased education of consumers that accompanies it, will be an important objective in the post-war years. An increasing amount of attention is being given to improving nutrition through international co-operation in production and exchange of food. The raising of dietary levels and standard of living all over the world no longer seems an impossible hope. The various United Nations

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[1] Beilby, O. J. Comparative Labour Efficiency in Agriculture. *The Empire Journal of Experimental Agriculture*, Vol. IX, No. 34, 1941.

[2] *The International Yearbook of Agricultural Statistics*, 1940. Rome; and Taylor, H. C. and Taylor, Anne Dewees. World Trade in Agricultural Products. The MacMillan Co., New York, 1943.

[3] Pearson, Frank A. and Harper, Floyd A. The World's Hunger. Cornell University Press, Ithaca, New York, 1945.

organizations and specifically the F.A.O. have as their prime function ways and means of doing just this.

Dietary changes are bound to take place as the average per capita income rises. These dietary trends offer new frontiers for agriculture. Pre-war estimates indicate that only about a tenth of the world's population—more than half of this tenth is on the North American Continent—lives in countries where the diets are composed of non-cereal-potato foods to the extent of more than 60%.[1] But even so, more and more vegetable carbohydrates and vegetable proteins were fed to animals and converted into animal products. Since the detour via the animal causes a loss of seven-to nine-tenths of the calories in the foods fed, more crops must be grown to supply the same number of people with the same amount of calories.

"Urban consumers are going to want to eat fewer potatoes, dry peas and beans, and less bread, but bread made of white flour. At the same time they will want to eat more milk, cream, butter, cheese, margarine, beef, veal, pork, eggs, poultry meat and more fruit—particularly citrus fruits and bananas."[2]

The marketable output of farm products can be increased in four different ways: (a) expanding the area of cultivated land (new land, by irrigation, and by drainage), (b) shifting to more intensive crops and live stock, (c) increasing crop yields per acre and output per head of live stock by application of improved practices, (d) expanding the use of mechanical power. The extent to which production will be expanded depends largely on domestic and export market outlets.

On the export side, Canada has highly specialized agricultural resources that are suited, and have been developed, to produce for export. At the same time, Canadian agriculture has an important stake in trade since foreign markets are needed for surplus domestic agricultural products if we are to have reasonably full utilization of the developed agricultural resources.

Canada's ability to contribute to world food needs requires that there be a world market price that makes it profitable to sell her products. At pre-war levels of world agricultural production the quantities of many agricultural commodities that importing countries were willing to purchase, at a price sufficient to secure adequate returns to efficient producers, were considerably smaller than the exporting countries wanted to sell. Canada's ability to contribute to world food needs also depends upon the national measures or controls exercised by various governments to channel, impede, restrict or promote international trade.

1Bennett, M. K. International Contrasts in Food Consumption. *The Geographical Review*, Vol. XXXI, July, 1941.

2Brandt, K. The Reconstruction of World Agriculture. W. W. Norton & Co., New York, 1945.

A modern Canadian packing plant showing hog carcasses

The Farmer

by **H. S. FRY**

Associate Editor, *The Country Guide*, Winnipeg

WHATEVER cause there may be for pride in the human race, we are not lacking in conceit. Given the power of reason, we have proved ourselves able, if we put our minds to it, to conquer everything except life, death and taxes. About one more good war on the same progressive scale as the last two, and we will have whittled the obstacles down to one. Western civilization in particular has exhibited an amazing ingenuity in finance and the exploitation of human and other resources.

H. S. FRY

Science and free enterprise have combined to build more factories to make more products to sell to more people to make more money than ever before. We can make fabrics out of glass, plastics out of weeds, rubber out of wheat and a silk purse out of a sow's ear. We have seeing eyes, iron lungs and atomic bombs. We can travel at unbelievable speeds over land, under water, on top of it and in the air; and science has enabled us to save more lives and kill more people per year than at any time in the world's history. This is progress.

As a race, we have been prodigious exploiters, and among the resources chiefly exploited have been the farmer and the land. Almost as soon as new land has been broken, its fertility has begun to decline. Scattered over wide areas and facing competition from farmers of other lands with a similar urge toward production, the farmer has been buffeted by circumstance and the indifference of society until his last estate is as a sacrifice on the altar of urbanization. As long as new lands were available for additional farmers to till, or until society awakened to the fact of its ultimate dependence on the soil, there was little hope of stemming the tide of neglect. Even now, the signs are faint though definite enough owing to erosion and other manifestations of misuse and to the rise of international morality induced by the war.

Here is a frank statement of the educational and economic needs which would enable the farm community to solve its own problems. There will be individual and community exceptions, but the position of the farmer is analyzed so as to challenge our readers to think of the farmer's status in our national society and not to confine their thinking to out-dated concepts of well-being.

The farmer and the farm remain comparatively untouched by the swift tide of urban progress. Good roads are something to be desired, electrification something to dream about, and efficient schools too costly to more than contemplate. Adequate and reasonably priced medical, nursing and veterinary services would be a consummation devoutly to be wished and would go far to offset the disadvantages of snow-blocked roads, long hours of hard work, and the vagaries of the weatherman. If the farmer or his wife can grow their own garden truck, eggs, poultry, milk, beef, and pork, they can also pump and carry water, wash clothes the hard way and carry a lantern.

As a human being and a reasonably honest citizen, the law now declares him eligible for relief in the dry years. Oxen are still used for tilling the soil in parts of the Maritime Provinces and elsewhere. Settlers along the northern fringe of the Prairie Provinces are still laboriously clearing land with axes. Only a very small percentage of our live stock is purebred and a similarly small percentage of the grain seeded each year is registered seed.

Economically, the farmer represents an industry composed of more than 700,000 small, independent operators. His instinct is creative rather than acquisitive. Circumstances compel him to be his own business manager, accountant and workman. They have also made his outlook individualistic, his thought conservative, and his politics an asset to any government, because his mug and his wump are traditionally on the same side of the fence. He combines a business

A familiar scene at the time of the corn harvest

with a way of living, and as he increases his business by the addition of more land, he also increases his isolation by pushing himself farther away from his neighbors. If the automobile has widened his area of contact, it has also taken something from the solidarity of the rural community; and if mechanization has increased his acreage and reduced the labor involved in farming, it has reduced the erstwhile self-sufficiency of the farm, while at the same time threatening the existence of the farm family unit.

Socially, the farmer is a balance wheel by reason of his sound judgment when all the facts are placed before him; an elixir of life to urban centres, because of his larger family; and an anachronism, because, of all population groups in an era of organization, he stands most in need of organization and is the most reluctant to support it. To a greater extent than any other important group in the country, he is shrewd in his appraisal of men and events. To a similar extent, he is wise by reason of his freedom from the distractions of urban life. His general level of education is lower than in most other groups, because he is at a disadvantage with respect to the costs of education, and because the character of his work does not induce a compelling desire for it.

This rural vignette, important as the facts may be, is secondary to the farmer's real status as a Canadian agricultural resource. Obviously he acquires such status by reason of his association with the soil, though not alone because of his position as a producer or an occupier of land. The soil itself is the resource upon which man has built his successive civilizations, and the farmer in all ages has been its custodian.

The fact that Canada is a great agricultural country merely enhances the place of the farmer as the caretaker of the nation's soil. All civilizations have been chained to Nature by means of the soil, and if the farmers of forty centuries have, either alone or with the aid of science, been able to mould and to some extent direct natural processes to satisfy human ambitions, the fact remains that financial and industrial titans could have been titanic only by consent of Nature and the soil.

This issue of the *Agricultural Institute Review* contains a further elaboration of the fact that our civilization is inescapably anchored to the soil, but it is important

that it be mentioned here, when the place of the farmer is under review. Without the farmer there would be no government, or skyscrapers, or fine arts, or education, since he stands as the symbol of our dependence on the top few feet of the earth's crust. Viewed in this light, the farmer becomes an important citizen, to whose work we owe an obligation which we have not yet begun to meet in an orderly and effective manner.

One of our most lamentable failures in this respect lies in the fact that we have not yet begun to teach our children the significance of the soil and the farmer's position in relation to society. If we had been doing this for a generation, it would be easier to stop the wastage of our soils from various causes, and public support would be easier to secure for legislation which would put a check on the inefficient producer, the weed-spreader, the scrub-bull-owner, the soil-exploiter, and the generally improvident husbandman. We would realize something of the social and economic base which the soil provides for our national economy, and we would be more easily alarmed at the dangers of reduced or ill-balanced fertility.

Practically all governments in the western world recognize, in some measure, the relationship between society and the soil on which it exists. Departments of Agriculture are set up, for better or worse, and a system of agricultural services is established, designed to increase production and improve production practices. In a democracy such results as are secured must be brought about largely by persuasion; and it is easier for the educated to persuade or to accept persuasion than for the uneducated to do either. Thus education is pre-requisite to a successful democracy, but we have applied this fact only inadequately in establishing a proper relationship between society in general and agriculture.

To the city dweller, where food comes from or how it is produced is of comparatively little interest, as long as it is obtainable in sufficient variety and at a sufficiently low price. To the farmer, what happens to the food he sells, has, until this particular moment in the world's history, been of little concern, as long as the price was right. To him, a bushel of No. 1 Northern wheat, or a 200-pound hog, have been just what the market price said they were, regardless of nutritional values; and to the urban consumer, a quart of milk has been worth twelve cents, only if it could not be bought for eleven.

If, as I suspect, the farmer is a national resource of particular importance, as well as an agricultural resource, it follows that he needs every encouragement in his custody of the soil. He is entitled to the full respect of every Canadian citizen. He needs the aid of science and technology. In addition to experience in the art of husbandry, he is entitled to and must receive education in its principles, and an appreciation of its attendant sciences. By reason of his lesser contact with the origins and centres of new knowledge, the applicability of this newer knowledge must be brought generously to his attention.

So little does the non-agricultural portion of society understand the farmer and his problems, that such efforts as are made toward co-operation in agriculture

A Canadian wheatfield

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● *The most familiar task.*

frequently meet with strenuous opposition. In actual practice, co-operation in agriculture can be used as an effective tool toward more efficient production. In no other way can farmers become as well informed about the importance of market quality; and in some measure at least, it is a substitute for, and buttresses, individual experience and education. It is the natural method open to the farmer for overcoming, to some extent, the handicap of comparative isolation.

Wars are not completely evil, except in their origins. Modern war is shockingly destructive, both of life and property, but it does bring in its train some progress in human understanding, some growth of interdependence, and some practical evidences of reform in the conduct of human affairs. The United Nations Organization, and the various international organizations complementary to it, encourage hope of a better world. The acceptance of the Food and Agriculture Organization, for example, by the governments and peoples of so many countries, carries implications for the Canadian farmer which can well give him a more honored place in our society and a better understood significance in our national economy. The general fear of a post-war collapse of trade and prices, together with the urgent and extensive need for food, have focused a great deal of public attention upon the farmer and his activities. The great strides made during the war in our knowledge of nutrition have enhanced both his importance and his responsibilities. Plans for post-war reconstruction have included improved roads, housing, and the introduction of rural electrification in many areas where this service has not hitherto been available. In addition, such plans include programs for improved health services, while the war itself has been responsible for introducing some measure of controlled production and post-war price stabilization.

Each of these factors and happenings have their bearing on the farmer as an agricultural resource. They tend, if successful, to improve his security and confidence; to make him more economically able to be an efficient caretaker of the soil; to enable him to keep step more readily with the advances of technology; and to yield him what should be the right of every democratic citizen, a comfortable home, surrounded by a reasonable number of the amenities of life.

Canada has acquired new status as a result of the war. She is and will continue to be a great agricultural country, but she has moved onto higher and more pretentious ground as an industrial nation. The proportion of our agricultural population to the total Canadian population has decreased, and unless we run into a period of economic stagnation, it will probably continue to decrease. The war, however, has given us a new respect for the farmer, and an indication of the possibilities of increased agricultural production. There are also signs that it has enlivened the sense of responsibility of Canadian farmers, and has induced in them a readiness to accept some direction, to more

generally apply improved practices, and to attempt, by local or municipal organization, the solution of some problems solvable by their own efforts.

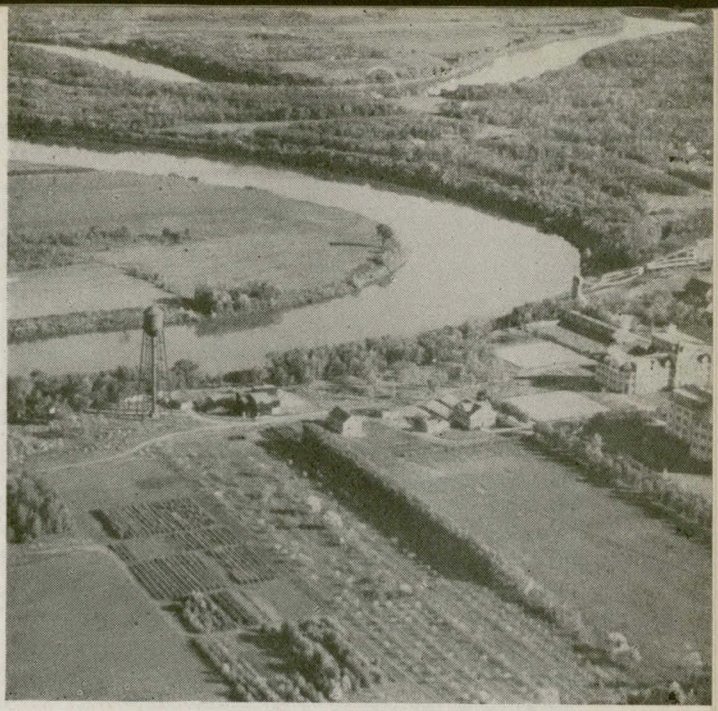
Mention has been made of the fact that farmers do not take readily to organization. They are not ready talkers; and speech is the chief working tool of an organization. Throughout this country, it is true, there are thousands of farm organizations big and small, but it is surprising how many of them are government sponsored and to some extent controlled—agricultural improvement associations, breed associations, agricultural societies, seed growers' associations, boys' and girls' clubs and many others. For the most part, and excepting principally many small community organizations and a very few of provincial or inter-provincial scope, only the great co-operatives are entirely self-directed and controlled.

More than this is needed. One outstanding need in Canadian agriculture is a self-managed rural community organization with an over-all purpose. Every rural community should have one, but few have—an organization catering to the needs and serving the purposes of all, and dedicated to the business and the way of living of that community, a generator of improved life and business, attending to the needs of the community for better bulls and community centres, weeds and roads, or soil wastage and schools. In communities so organized, government agricultural services would undoubtedly be used much more freely and with more beneficial effect. Communities so organized would soon find that the effort required is the most enduring material out of which an improved community life can be constructed.

Free literature on agricultural subjects may be obtained from the Publicity and Extension Division, Dominion Department of Agriculture, Ottawa, Canada. In writing, state what branch of agriculture, i.e. poultry, dairy cattle, bees, etc., you wish information about — or send for the "List of Publications" to see what pamphlets are available.

Society also owes something to the farmer by way of opportunity for farm youth to settle on the land. Experienced young men are often frustrated in their desire to follow in the footsteps of their fathers and to build homes on the soil, by reason of their inability to make a start under conditions that will give them a fair chance of succeeding. It has been suggested that a civilian edition of the Veterans' Land Act may be necessary, not only to assist farmers' sons, but farm workers who are worthy of encouragement and whose talents would better serve the country on the land than elsewhere. With new land becoming scarcer and with fewer farmers in prospect for the future, society must take care that such encouragement as is given to agriculture is selective, and that the experience and ambition of worthy young men is not wasted.

We talk and write a great deal about the conservation of our natural resources. The soil is the chief of these and the farmer the key to its conservation. His, however, is not the full responsibility. He can be expected to do his best only if the conditions are fair—and society makes the conditions. Research, experimentation, investigation, education, and extension are the responsibility of the state and in no single one of these imperatives has the state yet done its full duty. When it is remembered that to be really successful the farmer must not only be an efficient workman and far-sighted manager, but have some general knowledge of the sciences and their importance, such as botany, entomology, chemistry, pathology, bacteriology and physics, and that at the same time he should be carpenter, blacksmith and Jack-of-all-trades, his right to expect the fullest co-operation from the state should not be questioned. If his right to be regarded as the key to the use of all other agricultural resources is unquestioned, then the responsibility involved in the manifold duties associated with the care of the soil should not be borne by him alone. The first duty of the state is the care of its soil and consideration for its stewards.



● *The Red River at the University of Manitoba.*

Agricultural Science and Education

by

L. E. KIRK

Dean, Faculty of Agriculture, University of Saskatchewan, Saskatoon

Arrangements exist whereby scientists from different institutions may work together to solve a single problem, or a group of related problems. The result has been a degree of co-operation which is rather unique among scientific workers.

IN KEEPING with the agricultural resources of this country, which are very great and still relatively undeveloped, the Canadian people have strongly supported substantial provision for agricultural science and educational facilities. These services emanate from both Dominion and Provincial sources. In general the educational facilities are provided by provincial universities, colleges and schools, while funds for research have come mainly, but by no means entirely, through Dominion Government agencies. It will be convenient to deal with the educational facilities first.

L. E. KIRK

Ontario, Quebec and the four western Provinces each support a college of agriculture. In Saskatchewan, Alberta and British Columbia the agricultural college is constituted an integral part of the provincial university. In Quebec, Macdonald College is a faculty of McGill University. In Manitoba and Ontario the colleges originally were separate institutions but now the Manitoba Agricultural College is a faculty of the University of Manitoba, and the Ontario Agricultural College is closely affiliated with the University of Toronto. An agricultural college at Truro, Nova Scotia, serves the three Maritime provinces of Nova Scotia, New Brunswick and Prince Edward Island.

Each of these colleges, except Truro, offers a four-year course leading to the degree of Bachelor of Science in Agriculture. The college at Truro provides two years of the degree course and, by special arrangement, its students may attend the last two years of the course at either Macdonald College or the O.A.C. and thus obtain the Bachelor's Degree.

Research work leading to the degree of M.Sc. is being pursued by advanced students as follows: Manitoba; in Animal Science, Bacteriology, Entomology, Plant Science and Soils. Saskatchewan; in Field Husbandry, Animal Husbandry, Soils, Dairying, Agricultural Engineering and Farm Management. Alberta; in Animal Nutrition, Plant Genetics, Plant Biochemistry, Plant Pathology, Dairy Chemistry, Dairy Bacteriology, Soils, Horticulture and Entomology. In British Columbia students may proceed to the Master's Degree in various lines of study.

At the O.A.C. arrangements are being made whereby graduate students may obtain a Master's Degree from Toronto University by doing part of their work at the latter institution. This is already possible in certain subjects, notably Field Husbandry and Poultry Husbandry.

McGill University, in conjunction with Macdonald College, provides an opportunity for post-graduate students in Agriculture to obtain the degrees of M.Sc. and Ph.D. in several sciences basically related to agriculture. This is the only institution in Canada at present where the Ph.D. may be obtained by such an arrangement.

Another feature of agricultural education in Canada has been generally adopted. This is the two-year practical course in Agriculture leading to a Diploma. The course is of five months' duration each winter, a time when young men from the farms can conveniently attend. It is designed especially for those who are planning to farm. With little variation this course is available at colleges of agriculture in all provinces except Alberta where a similar course is provided by Agricultural Schools at Olds and Vermilion. The Agricultural School at Kemptville, Ontario, also provides a two-year course of this kind.

In addition to the Diploma courses, opportunities for vocational training are provided by all Agricultural Colleges and Schools in the form of "short courses" extending in length from one week to three months. Most of them are of two to six weeks' duration but occasionally they may last much longer. Departments of Agriculture in several provinces also do considerable short course work through their Extension Departments and Agricultural Field Services.

In all provinces except Quebec the Universities and Colleges mentioned above are the only institutions authorized to grant a Degree in Agriculture. In Quebec two other colleges, in addition to Macdonald College, confer degrees, namely the Agricultural Institute at Oka (under the University of Montreal) and the College of Agriculture at Ste Anne de la Pocatiere (under Laval University). The latter institution is organized to direct studies for advanced degrees in agricultural chemistry, botany and rural economics.

Provision is made by the Colleges in all provinces for undergraduate "options" which permit students with acceptable ability to elect a moderate degree of concentration on one of several subjects or groups of related subjects.

In estimating the accommodation which is available in the agricultural colleges across Canada it is important to make a distinction between normal peace-time conditions and the crowded conditions which obtain at the present time on account of the abnormally heavy enrolment of men from the armed services. Excluding Oka and Ste. Anne de la Pocatiere, for which figures are not available, all of the other colleges together would normally accommodate about 1,250 Degree and 1,200 Diploma students. The latter figure includes the Schools of Agriculture in Ontario and Alberta. Just now the number of degree students is much larger, probably nearer 2,000, although no accurate figures are available.

Normally about 100 students annually have pursued studies leading to the Master's Degree but this number will certainly double and perhaps treble, in the near future.

Research Facilities

Dominion Department of Agriculture

By far the largest organization in Canada which conducts investigations in agricultural science and practice is the Dominion Experimental Farms Service. This is one of the four main departments of Agricultural Services of the Dominion Department of Agriculture, the others being Science Service, Production Service and Marketing Service.

The total number of Dominion Experimental Farms and Stations, as of today, is twenty-eight. There are one or more of these Farms in every province of Canada, each strategically placed to serve a particular agricultural area. The Farms vary greatly in size and in the variety of their "projects", the latter depending on the farming problems peculiar to the area in which they operate. The work is organized under several Divisions with head offices at the Central Farm in Ottawa. Projects are drawn up, usually in con-

sultation with the Superintendent of the Branch Farm involved, and become effective on authorization of the Director. Some indication of the extent of this work is that in one year as many as 1,500 of these projects were in operation. A single project may represent the full-time work of a large group of specialists, or be only the part-time responsibility of an individual.

The Dominion Experimental Farms operate a total of 10 Sub-stations, 162 Illustration Stations and 49 District Experimental Sub-stations. The ten Sub-stations extend the investigations of certain of the Farms to areas not adequately served by the Farms themselves, while the Illustration Stations and District Experimental Sub-stations are devoted chiefly to work in the nature of trials and demonstrations relating to farm practices.

"Science Service" of the Dominion Department of Agriculture conducts agricultural research in 45 Laboratories located throughout the Dominion. The head offices and five of the Laboratories are in Ottawa, and two or more in each of the provinces. Most of them are located at Dominion Experimental Farms and Stations. Six are at Agricultural Colleges.

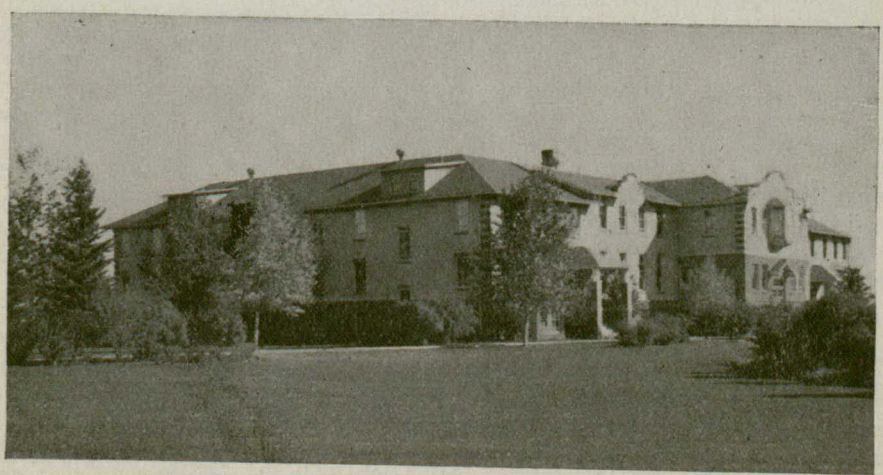
Scientists in these Laboratories devote their attention to a wide variety of problems. In most of them the work is specialized; 23 in entomology, 12 in plant pathology, and the remainder in other lines.

Important researches are undertaken also by the Agricultural Economics Division of "Marketing Service". This Division works with other Divisions of the Department of Agriculture and with other Departments of Government in the conduct of its investigations. Its activities range from surveys of ranching conditions in western Canada, conducted in co-operation with the Experimental Farms Service, to studies of food consumption levels and nutritional standards, done in co-operation with the Department of National Health and Welfare. A large part of the research undertaken has been conducted with the assistance of Provincial Departments and Colleges. The Division maintains an office and staff at the Universities of Manitoba, Saskatchewan, Alberta and British Columbia where an extended program of research is underway.

Reference should be made to the "National Committees" of the Dominion Department of Agriculture, many of which are concerned with research projects and with co-ordinating the work of committee members who, because of their interests or specialized training, may be invited to participate. The Committees are organized mainly to facilitate co-operation between the Dominion and the Provinces whenever joint action is believed to be advisable.

National Research Council

Another Dominion Government institution which plays a very important role in agricultural research is the National Research Council. This phase of the Coun-



Dormitory at Olds School of Agriculture, Alberta

cil's work is organized under the Division of Applied Biology.

The Council maintains well equipped laboratories at Ottawa and a new Prairie Regional Laboratory to serve western Canada is under construction at the University of Saskatchewan, Saskatoon. These Laboratories are primarily concerned with the development and improvement of industrial processing, storage and transport of foods, and industrial utilization of agricultural wastes and surpluses; but important work more directly related to agriculture is also being done.

Much of the Council's work in Agriculture is carried on by "Associate Committees" which co-ordinate and support agricultural research. In addition to Council members, these Committees include representatives of the Dominion Department of Agriculture and university scientists interested in its special work. One of the most important of these is the Associate Committee on Grain Research which includes also scientists of the Grain Research Laboratory of the Board of Grain Commissioners at Winnipeg. This last named Laboratory has been a tower of strength in the comprehensive researches with wheat conducted under the auspices of the Committee.

Through a plan of assisted researches the Council has been able to enlist the co-operation of university scientists who assume responsibility for "grants", thus enabling many graduate student assistants to proceed with research who might otherwise be hampered for lack of funds and, what is equally or more important, the student assistants are given an opportunity to forward their education and obtain advanced degrees. The grantee must provide his services without charge. Students may obtain permission to do their work in science laboratories of any Dominion or Provincial institution where special facilities are available for the problem or project which is to be undertaken.

Generous scholarships are provided by the Council to enable students with capacity for original research to continue their work in agricultural science. The number of research workers available for service in Canada has been very considerably increased by this means.

Universities and Colleges of Agriculture

It goes without saying that the agricultural colleges, in conjunction with the science departments of the universities to which they belong or are affiliated, have been the foci of much research activity. This is to be expected, and indeed it is essential, if students are to attain a competence in pure and applied science. Since the higher institutions of learning are the sources from which the personnel for science laboratories are recruited, the importance of a lively interest in research and a healthy research atmosphere, is obvious.

The tradition of research in agriculture in Canadian universities rests also on a keen sense of responsibility to the farming industry. The important place which agriculture has always held in the national economy is no doubt largely responsible. Thus agricultural colleges have directed their efforts toward solving the many problems which inevitably confront farmers in a new country, and in doing so have made an enviable reputation for themselves in agricultural science. They have also been stimulated by unique opportunities for co-operation, and by a spirit of healthy rivalry, with the much more liberally financed Laboratories of the Dominion Department of Agriculture and the National Research Council.

Perhaps the best that can be said of the past accomplishments and future possibilities of agricultural research in Canada is the very extensive interlocking arrangements which have been developed for bringing the work of many scientists from different institutions to bear on a single problem or group of related problems. The result has been a degree of co-operation which is rather unique among scientific workers.

This method of working has been deliberately encouraged and its effectiveness has been increasingly evident. Many striking examples of the results of co-operative effort could be cited and, if space were available, it would be of interest to review some of these in detail. The development of rust resistant varieties of wheat is an excellent illustration. Only this spring the Associate Committee on Grain Research announced another notable achievement of a new

variety of wheat resistant to wheat stem sawfly. This was accomplished at the Dominion Experimental Station, Swift Current, Saskatchewan, but it included the work of many co-operators. Scores of important achievements in all phases of agriculture could be cited.

This brief review of the agricultural science and educational facilities in Canada does not pretend to be exhaustive. No mention has been made of the Ontario Research Foundation which conducts a considerable amount of research in agricultural matters. Saskatchewan, Alberta and British Columbia have Research Foundations which administer funds in aid of research in agriculture. The Prairie Farm Rehabilitation Administration has helped to finance a number of investigations in which it is interested, especially those relating to soil conservation and cultural methods. Doubtless there are other activities, less familiar or unknown to the writer, especially in the Province of Quebec, which are deserving of more prominence in this statement, but perhaps enough has been written to indicate the picture in broad outline.

Great as is the natural agricultural wealth of this country it can be exploited and at the same time conserved, only by careful husbandry based on scientific principles and the informed judgment of those who till the land. These latter requisites are as truly a part of the agricultural resources of Canada as is the soil on which depends the welfare of so large a part of the population.

Entrance, Main Building, Macdonald College, Quebec

SERVING SASKATCHEWAN FARMERS

The current enlargement of the field service of the Saskatchewan Department of Agriculture by the employment of additional trained Agriculturists who have served in the second world war, is intended to help bridge the gap between experimental and research institutions and the men who are producing food to meet world needs.

It is the aim of the Saskatchewan Department of Agriculture to assist rural organizations in developing agricultural policies which will use the accumulated information gained by the Experimental Farms, the College of Agriculture and other research agencies.

Saskatchewan farmers can get helpful information directly from any Government institution, Provincial or Dominion, but it is the duty of Agricultural Representatives to serve the farmers of Saskatchewan individually and collectively in making known to them, and to all young people working in Junior Clubs, the latest results of experimental research. It is also the duty of Agricultural Representatives to be familiar with government policies through which direct assistance is available to farmers, and to advise farmers regarding them.

Agricultural inquiries may be directed to any Agricultural Representative or the Department Offices in Regina.

HON. I. C. NOLLET, *Minister of Agriculture*

The Future of Canadian Agriculture

by E. S. ARCHIBALD
Director, Experimental Farms Service, Dominion Department of Agriculture, Ottawa

ANY appraisal of the future of Canadian agriculture must take into consideration the nature and extent of Canada's agricultural resources on the one hand, and on the other the various economic and political forces, domestic and foreign, which will govern the use and development of these resources. Information on our agricultural resources is obtainable by surveys and in considerable measure is already available. As regards future economic and political developments, however, the best that can be done is to estimate the probable effect on our agricultural economy of the most likely eventualities. Nevertheless, with a realistic approach to the problem it may be possible to arrive at some useful conclusions.

Certain central facts may serve as a background to our thinking in this connection. It is well to remember that world events in recent years have rendered it imperative for all responsible governments, individually and collectively, to work for the removal of the causes of war. One major cause of war is want, the unsatisfied demand for adequate food, shelter and social security. It is in recognition of this fact that the United Nations have set up such organizations as UNRRA and the Food and Agriculture Organization, agencies directed to the world-wide relief of basic human wants. Success in this movement, in which nations undertake to assist each other, should react to the benefit of Canadian agriculture.

Further in the same connection, it is hopeful to note a growing conviction that the development and conservation of agricultural resources are matters of national responsibility. Governmental interest in expanding agricultural research, in maintaining farm prices, and in supporting conservation programs is an important sign of the times.

It is with some degree of optimism, therefore, despite the forebodings that experience of previous post-war periods would inspire, that we can assess the present status of Canadian agriculture and estimate its probable future.

Agriculture occupies a predominant position in the economic life of Canada. In 1942 the net value of agricultural production amounted to $1,352,000,000, or 47% of the gross value of all primary production in Canada. About 52% of the population of Canada was described as "rural" in the 1941 Census, as compared with about 24% in the United States and about 20% in the United Kingdom. Of the 3,363,111 males listed as gainfully occupied in the 1941 Census, 1,064,847 or 32% were engaged directly in agricultural pursuits, and it is possible that a like number derived their living indirectly from agriculture. The close connection between general prosperity and agricultural prosperity in Canada is therefore obvious.

With its relatively brief history in mind, the present status of Canadian agriculture is impressive. In 1941 there were in Canada some 732,000 farms, occupying 174,767,000 acres of land, of which 80,442,000 were devoted to cultivated crop production and 61,411,000 in pasture. Live stock maintained on these farms included 2,789,000 horses, 8,511,000 head of cattle, 2,862,000 sheep, 6,093,000 hogs. Poultry, mostly hens, amounted to over 63,000,000. Total capital value of the industry was set at $4,222,441,000. The gross value of all farm production in 1941 was estimated at $1,432,601,000, the

"Much of the existing agricultural production in Canada, especially as regards wheat, must be for export. It is a matter of prime importance, therefore, that future expansion of cropped acreage in Canada should be controlled in relation to the combined domestic and export markets... In the future of Canadian agriculture conservation must play an important role. In this there is an implication of responsibility: on the part of the individual farmer to the limit of his capacity; on the part of governments for whatever is needful beyond the capacity of individuals."

E. S. ARCHIBALD

major items being field crops, live stock and milk products.

The major characteristics of this industry are the predominance of mixed farming in Eastern Canada and of grain farming and ranching in Western Canada, with the growing of special crops, fruit, tobacco, corn, sugar beets, etc., in various small districts adapted thereto. A significant feature as regards land tenure is that 75% of the farms are operated by their owners. Only 4,813 farms in 1941 were run by managers.

With the foregoing brief survey of Canadian agriculture in mind, attention may be directed to some salient points which have a bearing on future developments, including some reference to soil resources, technical improvements, and the human equation in agriculture.

The Soil Resources of Canada

Future agricultural development must be limited by the amount of arable land available. According to a recent estimate by Leahey, based on soil survey experience, there are about 130,000,000 acres of land in Canada that are suitable for cultivation. The bulk of all arable land in Canada is found along the southern boundary, notably in the Maritimes - St. Lawrence - Southern Ontario Region and in the Prairie region of the West. As has been noted above, 80,00,000 acres[1] were actually in cultivation in 1941. It is therefore physically possible, on the above estimate, to bring something like 50,000,000 more acres under the plough. More exact information, of course, will become available with the progress of soil surveys.

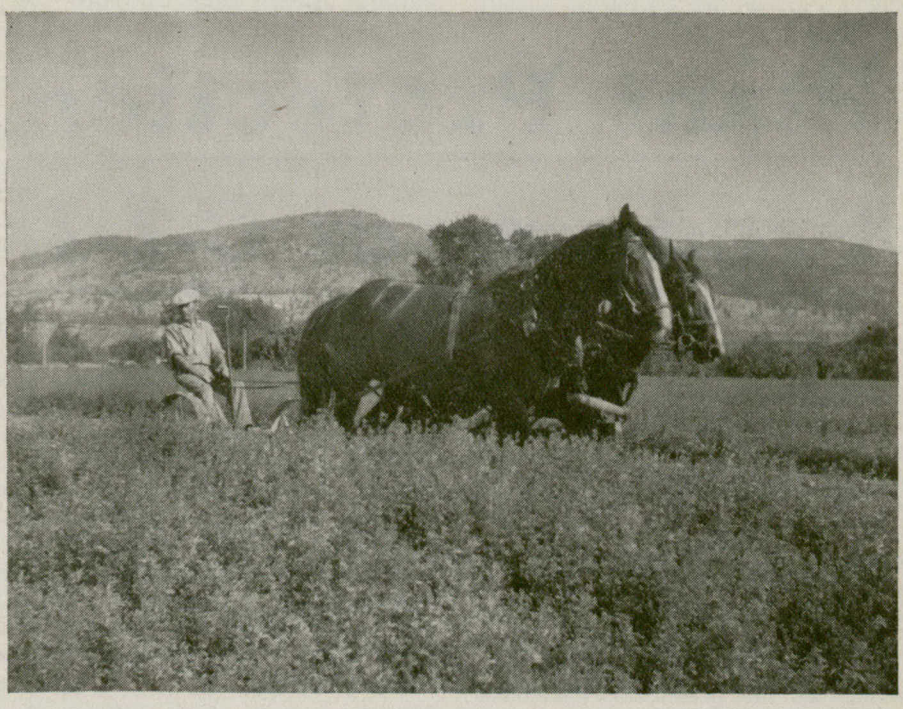
It is important to note that most of the more readily available agricultural land in Canada has been already occupied. Any futher increase in cultivated acreage must either be found on or beyond the fringe of settlement or by intensive improvement through clearing, drainage, irrigation, weed control, etc., of occupied land. In view of the isolated locations of certain known tracts of potential farm land, including the northern clay belt of Quebec and Ontario and areas in the Peace Valley, the intensive development of occupied lands, especially in well-settled districts may merit favourable consideration. This viewpoint is somewhat strengthened by the fact that much of the virgin land yet available for settlement presents difficulties in management, notably as regards the maintenance of fertility in the greybush soils of the prairies.

A preliminary inventory of all soil resources in Canada, through the work of soil surveys, may be completed within the next few years. To date, some 200,000,000 acres have been gone over in some degree of intensity, and plans are proposed for the acceleration of this work as a necessary prerequisite of a co-ordinated land use program.

The principal governing factor in the future development of Canadian soil resources is the fact that the acreage now in use is greater than required to meet domestic demand for agricultural production. On the basis of average yields and average domestic consumption as experienced in the four years 1941 to 1944, the total acreage required to satisfy purely Canadian demand need not exceed about 40,000,000 acres under crop, plus 9,000,000 or 10,000,000 acres under summerfallow. Only some six and a quarter million acres would be required for wheat production, as compared with some 23,000,000 acres as at present. These estimates support the already obvious fact that much of the existing agricultural production, especially as regards wheat, must be for export. It is a matter of prime importance, therefore, that future expansion of cropped acreage in Canada should be as much as possible controlled in relation to the combined domestic and export markets.

To what extent higher levels of nutrition within Canada would affect land use may be difficult to determine. Estimates made a few years ago indicated that the achievement of satisfactory levels of nutrition for the entire population of the United States would require an increase in the total crop acreage required of that country for domestic consumption from 311,000,000 acres (1936-40 average) to 351,000,000 acres, the additional 40,000,000 acres representing an increase of 13%. Assuming somewhat similar needs for better nutrition in Canada, any required adjustment in land use might at least re-

[1]Does not include improved pasture.



One basic crop, hay, reacts profitably to favourable soil conditions

move some acreage from the competitive export field. In view of the profound effect on Canadian farm incomes of the variable pressure to export, the possible effect of improved nutrition on land-use patterns is at least intriguing, and may be worthy of serious study.

In the future development of Canadian soil resources, a cardinal principle to be observed would seem to be the restriction of production, particularly surplus production, to manageable proportions. On the other hand, the widespread desire to acquire and cultivate the land must be recognized as legitimate. It may be possible to bring these opposing tendencies to a balance by some policy of land utilization which will discourage uneconomic use of land. The beginning of such a policy may perhaps be found in the P.F.R.A. Land Utilization program, whereby some 1,300,000 acres of land which is submarginal for crop production have been removed permanently from cultivation. A useful future application of this principle would be to withhold new areas from settlement until either economic conditions or scientific advances would justify their use.

The agricultural surpluses which were so troublesome to some countries, including Canada, in the pre-war years were, of course, symptomatic of international maladjustment in trade. There is ample evidence that, for the world at large, there has never been too much food. Dr. H. H. Bennett, of the U.S. Conservation Service, has estimated that for the present world population of 2.2 billions the total acreage suitable for food production is approximately 4,000,000,000 acres, or an average of less than 2 acres per capita. If the objectives subscribed to by the 41 member nations of the Food and Agriculture Organization at Quebec are dealt with in sincerity, every available acre must eventually be brought under cultivation. The time may not be far distant when the production from all of Canada's soil resources will be assured of markets.

The foregoing discussion leads naturally to the subject of soil conservation. Canada's cultivated soils, while less subject to destruction than in some other countries, exhibit definite signs of deterior-

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C-I-L Garden Dust
"Trox" & "Trox-ide"
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Weed Killers:

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ation. Wind and water erosion, depletion of fertility, floods and water shortages, present problems of increasing gravity, both to the individual farmer and to the nation at large. In this connection it is noteworthy that in the recommendations of many provincially-established Committees on Reconstruction the need throughout Canada of a conservation policy comparable to that of the Prairie Farm Rehabilitation Act program has been given emphasis. The central idea of the P.F.R.A. program is that of co-operation among individual farmers, communities and governments in the preservation of agricultural resources. In this there is an implication of responsibility: on the part of the individual farmer to the limit of his capacity; on the part of the governments for whatever is needful beyond the capacity of individuals. It is significant that the "Proposals of the Government of Canada" to the Provinces in the recent Dominion-Provincial Conference included definite and comprehensive plans for the conservation and development of agricultural resources. In the future of Canadian agriculture conservation must play an important role.

The Future of Technical Agriculture

To a continually increasing degree the farmers of Canada are drawing on technical agriculture for the better conduct of their business. By "technical agriculture" we mean those public activities which enable the farmer to benefit from services of experimentation, research, demonstration and legal regulations, which are beyond his capacity to provide for himself. Despite the tendency in nature for new problems to emerge as old problems are conquered, technical agriculture has scored many definite advances. Economic crop production is practiced today in climatic regions of Western Canada where this was not possible with the crop varieties available fifty years ago, a change effected by the work of plant breeders. Similarly, the combined efforts of plant pathologists and plant breeders have conquered plant diseases which threatened extinction of production in broad areas. Reference might also be made to many technical advances in the fields of animal health, live stock production, food processing, soil management, insect control and agricultural engineering. Not the least of the advantages arising from various lines of investigation, soil surveys, economic research, etc., has been to governments and administrators in the intelligent development and application of agricultural policies. Progress in this relationship is of vital importance to the future of Canadian agriculture.

In no field of agricultural research is scientific knowledge more urgently needed and more lacking than in the relationship between soil condition (amounts and proportion of available plant nutrients) and the nutritive and health-preserving qualities of crops. This applies both to human and live stock nutrition. What is needed is to determine the reaction to soil conditions of the various nutritive properties of plants, protein, carbohydrates, fats and sugar, vitamin enzymes and hormones, the amounts and nature of minerals, all in relation to human and live stock nutrition, and what measures of soil management and plant breeding may be necessary to correct deficiencies and abnormalities. Our knowledge in this field, while expanding, is still elementary. The problems are real, and need for their solution co-ordinated and extensive research.

Another major problem is the control of insect pests. One example is the wheat stem sawfly, in the control of which definite progress is being made through the breeding of wheat varieties which are resistant to attack. The alternative to this venture would be the virtual abandonment of wheat production through extensive areas of Western Canada.

There are also many problems in the field of plant pathology which await solution.

Weed control is one of the most necessary and at the same time most promising fields of work open to the technical agriculturist. Powerful new weapons of eradication, such as the hormone-like "2,4,D" weed-killer, are being developed by chemists, the efficient application of which may be expected to reduce losses in crop yields from weed infestation. When it is considered that the average reduction in crop yields by weed competition is

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NNOR Rotenone Spray A remarkable new contact insecticide combining mannitan monolaurate and rotenone, thus producing tremendous killing power against aphids, leaf hoppers, mealy bugs, thrips and other insects. Being non-poisonous, NNOR is particularly suitable for use on vegetables and certain types of fruit stock. An excellent replacement in many instances for nicotine sulphate.

BASI-COP* (tri-basic copper sulphate)—Introduced for the first time in Canada, Basi-Cop is a neutral insoluble copper compound containing twice as much copper as ordinary copper sulphate or bluestone, consequently is more economical. An ideal spray material for control of fungus diseases of potatoes, sour cherries, grapes, tomatoes, celery, etc.

DAY-LITE* DUST with tri-basic copper sulphate as the active ingredient. Day-Lite Dust contains 7% metallic copper. Its big advantage is that it can be applied during the day as it does not require the action of dew to form copper hydrate. Highly effective for tomatoes, pumpkins, cucumbers, potatoes, melons, sugar beets and squash to control fungus diseases.

Oil Type STOP-DROP* — A modern oil type hormone spray to prevent pre-harvest drop of apples and pears. Field tests have conclusively proved that oil emulsion greatly increases the effectiveness of hormone sprays and this "Green Cross" product is definitely superior to old solvent base type sprays.

Dinitrosol*—An excellent water soluble spray material for dormant season application in orchards to destroy Bud Moth, Oyster Shell Scale, Pear Psylla, and certain species of Aphids. Used also as an eradicant ground spray against Apple Scab.

Spralastic*—This improved Neutral Liquid Spreader and Sticker is used with Wettable Sulphurs and Lead Arsenates to produce a highly effective film type coverage on fruit. Spralastic should be used at the rate of 1¼ pints per 100 gallons of water in the calyx and first two cover sprays.

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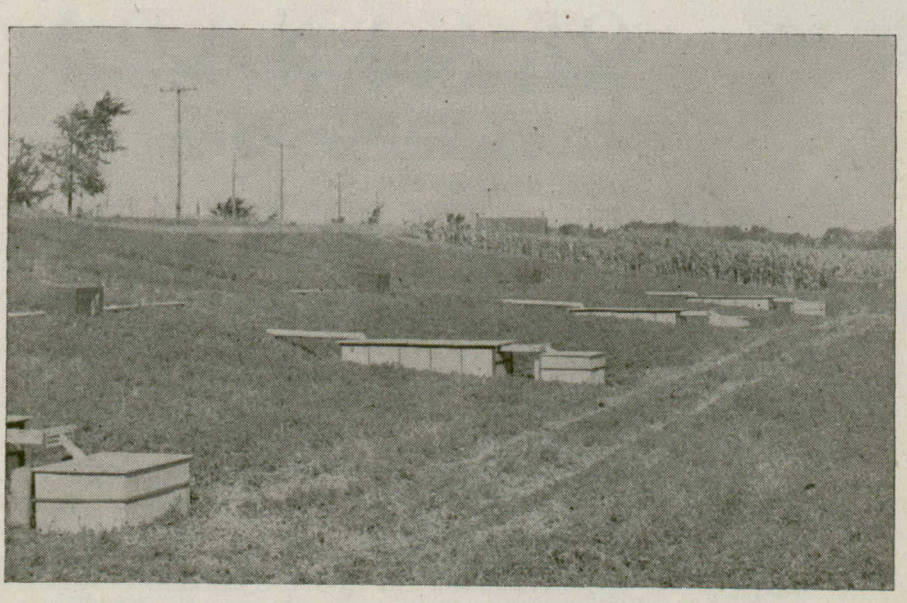
equivalent to a loss of actual acreage running into millions of acres, on which the work of seeding and harvesting is nevertheless expended, the gravity of the weed menace becomes obvious.

Figures have been cited above to indicate that the total potential acreage of cultivable land may be in the neighbourhood of 130,000,000 acres. In addition there may be nearly as much land which, while not suitable for cultivation, may be used for grazing. Improvement of this land affords an opportunity of expanding our effective soil resources. On P.F.R.A. community pastures for instance, it has been possible to increase carrying capacity from 53 acres per head of live stock in 1939 to 22 acres per head in 1944. This was accomplished by such practices as controlled grazing, development of watering facilities and regrassing.

Only a few examples have been given of useful lines of future work for technical agriculture in the development and conservation of Canada's soil resources. They may suffice to show, not only the urgency, but the continuing and long-term nature of the task ahead.



RESEARCH IN SOIL CONSERVATION

Soil erosion measuring apparati on the Central Experimental Farm, Ottawa

Twenty-Sixth Annual Meeting and Convention

AGRICULTURAL INSTITUTE OF CANADA

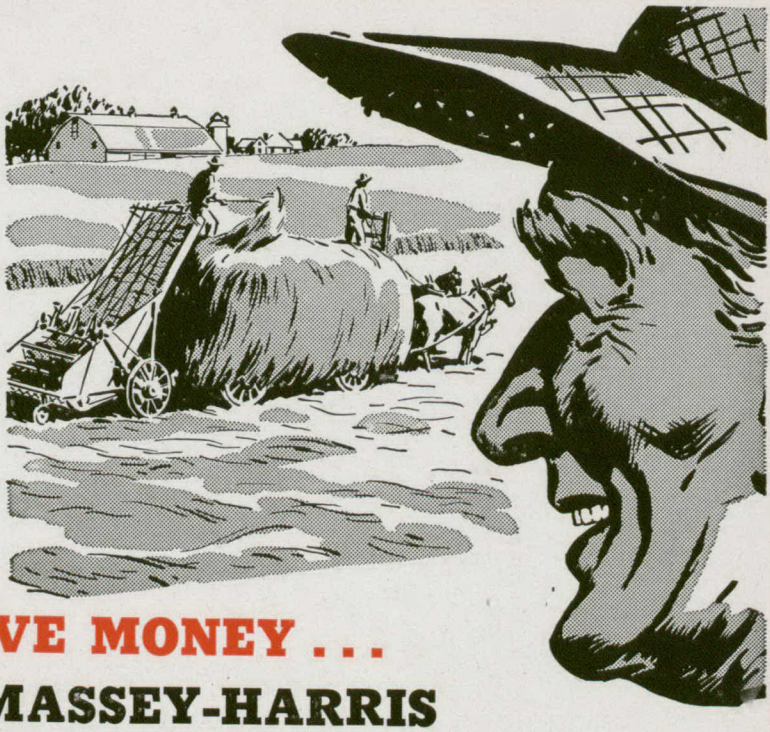
MACDONALD COLLEGE, QUEBEC

June 24 to 27, 1946

Group and Affiliated Society Meetings

Agricultural Engineering Group
Horticulture Group
Soils Group
Canadian Society of Animal Production (Eastern Section)
Canadian Agricultural Economics Society
Canadian Phytopathological Society

These groups will be holding individual sessions on Monday morning, June 24, and all day Wednesday, June 26



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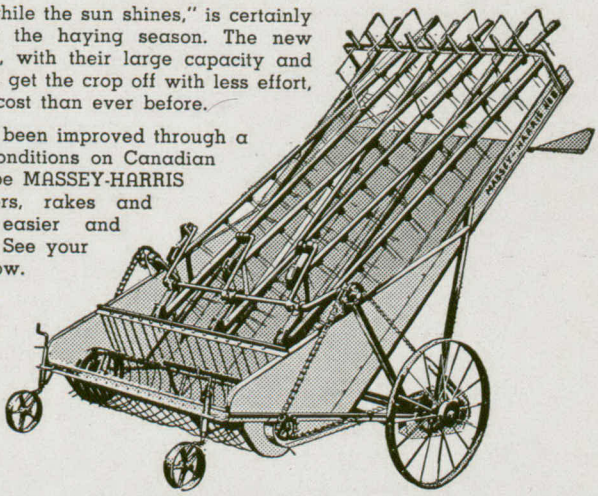

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Canada's Agricultural Resources, the subject covered in this issue of the *Agricultural Institute Review*, is presented as one of a series of informative publications on agriculture. It will serve as a helpful reference for educationalists, farmers and others interested in the agricultural field.

The Institute, which is responsible for this service, has a membership of about fifteen hundred of the leading agricultural college graduates engaged in governmental, university and commercial services in Canada. These members are grouped in twenty branches which are engaged in a thorough study of the agricultural problems of the Dominion. The *Agricultural Institute Review* is published bi-monthly and serves to keep the technicians in this specialized field aware of current developments in agriculture and related fields.

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